SERVICE TEXT
FILE NO. 177-172

TOSHIBA

CONPACT DISC PLAYER

XR-Z90

SUBJECT: COMPACT DISC PLAYER TROUBLE SHOOTING MANUAL

REMARKS

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INTRODUCTION

Toshiba has developed a long-waited compact disc, "XR-Z90", which allows us to make an entirely new experience by providing a new audio source.
XR-Z90 has been designed attaching the greatest importance on sound quality and operatability to obtain the best capability the compact disc has.
The sound quality of a compact disc player is greatly dependent on the property of analogue circuits including a D/A converter. For this reason, a high-speed integrating type of a D/A converter is adopted. Signal disturbance associated with scratches on the disc in compensated by making use of a one-beam time-difference detection tracking servo. The keystone of operationablity of the CD player is a random access to find out a start point of a desired piece of music or information. In addition, facilities to fulfil this function, which include a program memory, a next-play and repeat-play, are fully provided, and the operating system gets rid of an image of a desk-top small computer to create fashion of a delux audio product.
Toshiba developed and marketed a CD player in November, 1982. Toshiba's long-experienced technology on the player won a high reputation as achieved on stereo products of an analogue system. Toshiba will solicit your continued patronage on CD players as well.
The instructions described in the following will serve as reference in servicing and understanding characteristics and functions of the CD player. We also hope the reference may be helpful for further development of Toshiba's technology in an AV system through your servicing activity.

Digital Audio Systems Engineering Development Dept.
Manager
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1 GENERAL DESCRIPTION ON XR-Z90

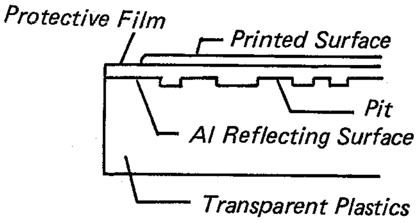
1-1 BRIEF DESCRIPTION ON COMPACT DISC

Conventional 30cm LP and single records are called an "analogue record", where as an entirely new playback system called a "compact disc system" has been developed. Brief explanations on this are given below.

1. DISC

(1) Compact Disc (CD) system

- In a conventional analogue record playback system, a needle is put on the groove cut in proportion to an amplitude of a signal to read out music signals by picking up vibrations which are produced by contact of the needle with the groove.
- In a compact disc system, on the other hand, a laser beam converged to nearly one micron is replaced with a needle, and is aimed at an array of pits recorded on a disc to converts variations of light reflection from the pits into digital signals.
  Therefore, it is not necessary to contact with the disc to produce music signals and the digital signals thus developed are processed with signal processing circuits to reproduce an original sound.



(2) DISC has two sides: signal side and label side

- A disc is 12cm in diameter and 1.2mm thick, and signals are recorded in its non-label side.
- A laser beam of nearly 800 nm in the wavelength is directly hit to a disc from its transparent plastic side and reflected at an aluminium reflecting plane to generate a small digital signal, which is consisting of 1 and 0 according to the reflecting factor, with the aid of a photodiode.
- Now imagine it as a TTL auto-focus camera which is a present mainstay in the camera field. The reflecting plane of a disc is a subject. To take out signals uniterruptedly, the camera (laser beem) focus is always being controlled so that the beam spot is focused and a pit array (called a track) is passed through the center of the lens by manipulating the lens back and forth, and right and left.
- In order to obtain the spot about 1 μm dia. on the AL reflecting plane, scars and stains on the surface of transparent plastics are the biggest determent. Furthermore, because there are importtant pits just beneath the printing surface separated by a thin protective film, the pits would be damaged even writing down with a pencil or ballpoint pen.
  Note: The diameter of a pit is as small as 0.6 μm.

2. CD System

(1) What kinds of signals are recorded?

- Lets a little more think of a digital signal although this was discussed earlier a couple of times. The packages of a 136 units-per-second signal series (called a frame) are delivered in succession. Analizing more this package, you can find that it is consisting of 588 bits of 1 or 0. Roles of these 588 bits can be categorized into lots of roles as a music signal which is the mainstay, as a time indication signal, as an inter-music pause signal, etc.
- TRACK NO.
  This is usually called a music number. Each music is numbered, and it is given in the descriptions of the disc you have bought. Memorying or searching can be conducted by using this number. (This is also called a "TNO".) This is usually 01 to 99 except some discs starting from a number except 01 (for example, 03 or 04).

- INDEX NO.
  This is used for subdividing one music number. In case of classic musics, each movement or each theme would be numbered. Some sets do not employ this numbering system due to a technical problem, but with XR-Z90, this system is employed to serve for memorying or finding-out of a heading address.
- TIME
  This indicates a playback time passing since the start of a track in minutes and in seconds. This is controlled by a quartz, so that the time is quite precise.
- A. TIME (Absolute Time)
  With XR-Z90, this time is not indicated but plays the important role inside the set.
- TOC (Table of Contents)
  On the beginning part of a disc, all of data including the number of musics, a music length, etc. have been recorded. With XR-Z90, because all data are first read out to a memory, an entered datum is compared with its corresponding correct recorded information to display an error indication, for example in case of misoperation of TEN KEY's.
- ERROR, CORRECTING SIGNAL, ETC.
  These are used in internal circuits and serve for correcting errors in which 1 and 0 are changed to 0 and 1, respectively, due to some causes. There are several kinds of signals except these signals.

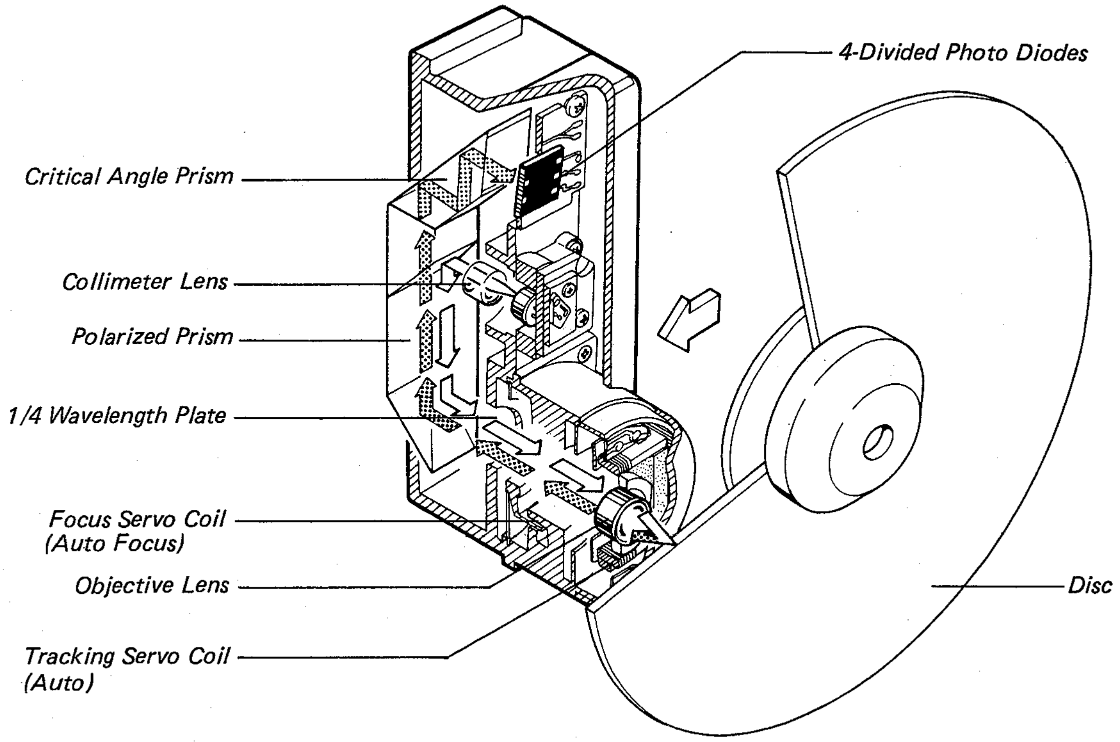
(2) The revolving speed of DISC is varied within the range of 500 r.p.m. to 200 r.p.m.

- The playback operation is started from the inner radius of a disc to its outer radius, but the speed of the pit array (track) being scanned beneath the focus point of the laser beam is always kept constant (constant liner velocity: CLV), so that the rotating speed is high at the inner radius of the disc and lower as farther from the center of the disc. After listening to a music at the inner radius, you could find that the revolving speed is sharply changed if you listen to a music at the outer radius.
- While XR-Z90 employs a constant linear velocity system, conventional analogue records employ a constant revolving speed system. In the compact disc, the rotation is controlled by a control signal obtained from the disc to keep the linear velocity constant.

(3) Performance is uniform and yet superb.

- As you know, transmission of a digital signal is almost not degraded provided that the signal is properly processed. No degradation of a signal during transmission from a recording site to your playback system is the key feature of a digital audio disc (CD system).
- A flow of audio signals which are varied every moment is sampled at the rate of as high as 44,100 times and the sampled data are represented in terms of 65,536 kinds of data called 16 bit data. With this CD system XR-Z90, signals from a recording site are first converted into digital data of 16-bits (2^{16} = 65,536) and then transmitted to your compact disc playback system.
- The frequency response is almost flat over the range of 5 Hz to 20 kHz. With an analogue transmission, peaks or dips appear at some locations, so that it is very difficult to obtain a flat characteristic such as with XR-Z90.
- The dynamic range is over 90 dB. Noises are almost not the least heard. In an analog system, signal levels to be handled are limited due to increased distortion caused by amplitude limit depending upon characteristics of circuits and components and frequency band limit, but 16-bit digital signals are not subject to these limitations, achieving the dynamic range as wide as over 90 dB. (For the SN ratio too, the same can be determined.)
- What is the reason why the wow and flutter figure is smaller than the measuring limit? It is that signals read out of a disc are first stored in a memory and then fed in turn to a D/A converter (A circuit for converting a digital signal to an analogue signal.) at a precisely-fixed tempo controlled with a quartz oscillator to reproduce original sounds.

CONCEPTS OF LASER PICK-UP


4-Divided Photo Diodes
Critical Angle Prism
Collimeter Lens
Polarized Prism
1/4 Wavelength Plate
Focus Servo Coil
(Auto Focus)
Objective Lens
Disc
Tracking Servo Coil
(Auto)

1-2 FEATURES

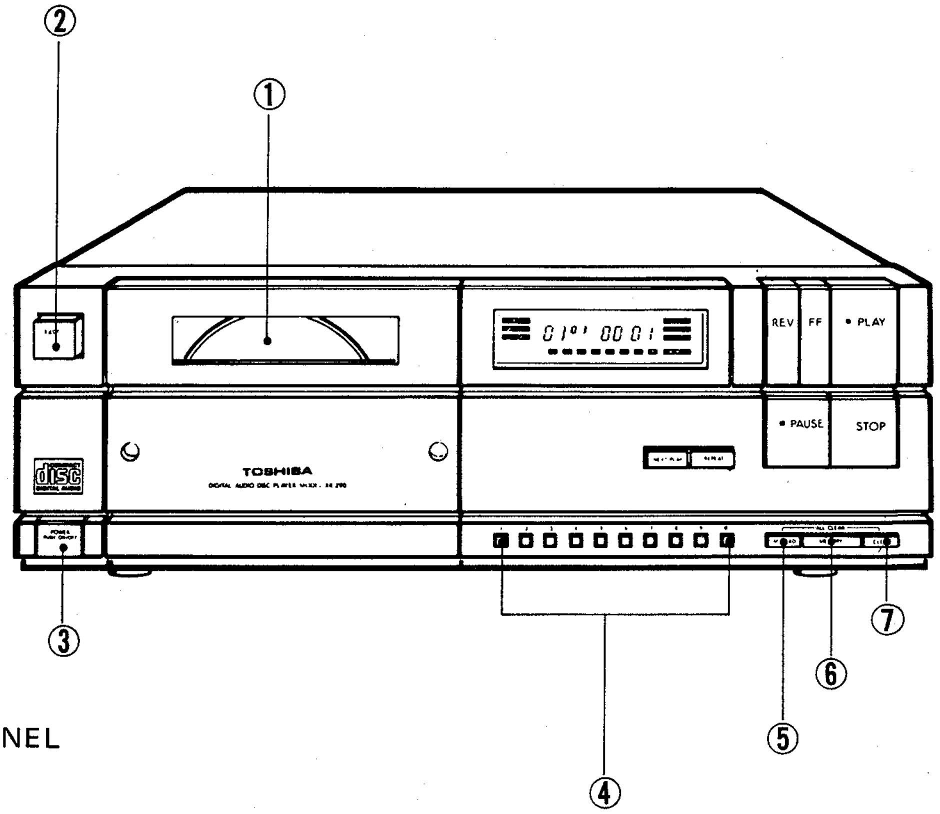
1. **Quick Random Accessing**
   Using program information recorded on disc, a microcomputer finds out quickly the beginning of a desired music by a simple key operation.
2. **8-program Random Memory Funciton**
   You can enjoy memoried playback of your favorite musics in your selected turn for 8 musics in maximum.
3. **Repeat Function**
   You can enjoy repeated playbacks of all musics or of only memoried musics at a touch of one button.
4. **All Pushbutton System**
   Application of feather-touch buttons and light pushbuttons allow any body to easily operate.
5. **Lots of indicators and displays**
   8 kinds of indicators and 3 kinds of displays offer you easy monitoring.
6. **Front Vertical Loading**
   A front loading mechanism with which a disc can be loaded and unloaded at the front side is adopted. A disc pocket can be widely opened, so that loading of a disc can be easily and quickly carried out.

1-3 SPECIFICATIONS

System:	Optical (compact disc system)
Quantizing bit number:	16-bit linear system
Channels:	2-channel, stereo
Frequency response:	5 ~ 20,000 Hz, ± 0.3 dB
Dynamic range:	More than 90 dB
Harmonic distortion:	Less than 0.004% (at 1 kHz)
Channel separation:	More than 90 dB
Wow & flutter:	Under measurable limits
Output voltage:	Fixed: 2.0 V Variable: 0 ~ 5 V
Pickup:	Semiconductor laser pickup
Memory capability:	8 music selections
Selection start locating:	Possible with track and index no.
Power supply:	220 V 50 Hz
Power consumption:	55 W
Outer dimensions (W x H x D):	420 x 148 x 350 (mm)
Weight:	9.8 kg
Accessories:	Low impedance PIN cord

1-4 OPERATION

1-4-1 CONTROLS AND THEIR FUNCTIONS



FRONT PANEL

① **Disc Pocket**
To open the disc pocket, press EJECT Button 2 . To close it, push it by hand lightly until it locks. Insert only one disc at a time.

② **EJECT Button**
Press this button to open the disc pocket. Press this button during play mode and after a few seconds, the disc pocket will automatically open.

③ **POWER Button**
Press to power ON. Another press turns power OFF.

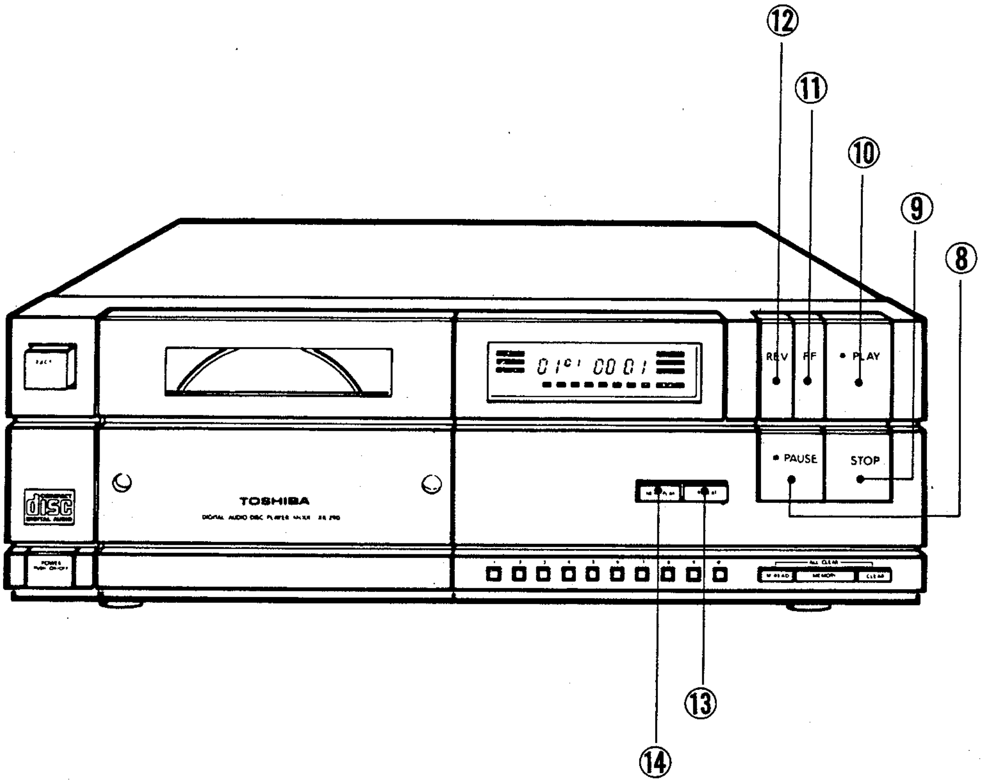
④ **Music Select Buttons (1 ~ 0)**
Press these buttons for input of track number and index number (hereafter called music number). Input of track numbers only is possible, but input of index numbers only is impossible. When track numbers only are input, the index number automatically becomes 0 1.

⑤ **M-READ (MEMORY-READ) Button**
Press this button to read out the memorized music numbers. Each music number is displayed for ten seconds. During that time, the read-out channel's indicator flickers on and off. With each press, channel progresses one by one, displaying memorized music numbers in the corresponding channels. While the music number is displayed, pressing PLAY button 10 , starts the music from the point at which PLAY button is pressed. (Beginning Start Auto Play).
In the same way, pressing PAUSE button instead of PLAY button results in a temporary stop of play. (Beginning Start Pause).

⑥ **MEMORY Button**
Press this button to memorize music number which is input by Music Select Button.
This must be done within ten seconds of input by Music Select button.
Memory of up to eight channels is possible.

⑦ **CLEAR Button**
To cancel music number immediately after being input by Music Select button. (After pressing MEMORY button, the music number cannot be cancelled.) To cancel the memorized music number, press CLEAR button and M-READ buttons simultaneously.
(Note that with this operation, all of the memorized channels are cancelled. It is impossible to cancel one specified channel only.)

⑧ **PAUSE Button (with lamp)**
(1) Press this button during play to stop play temporarily at that point. Lamp lights up.
(The pickup continues laser oscillation.)
Pressing PLAY button releases the pause mode, and starts play again.
(2) Press this button after operation of Music Select button to stop at the point where music selection has been input. Lamp lights up.
(Beginning Start Pause)
(3) Press this button after operation of M-READ button to stop temporarily at the point of the memorized music number.
(Beginning Start Pause)
In the pause modes (except the beginning of the first music selection) the set stops temporarily while laser oscillation continues, and the disc revolves.



⑨ STOP Button

Press this button to discontinue play. The pickup will return to the beginning of the first music selection. After ten seconds, the pickup stops laser oscillation, and the disc rotation also stops, waiting for the next command.

⑩ PLAY Button (with lamp)

(1) Press this button for play mode. The lamp lights up.
(2) Press this button after operation of the Music Select button to start play from the beginning of music selection which has been input.
(Beginning Start Play)
(3) Press this button after operation of MEMORY READ button to start play from the beginning of the music selection which has been memorized.
(4) Press this button during AUTO PLAY to change the mode to MANUAL PLAY.

⑪ F.F (FAST FORWARD) Button

Press this button for fast forward of music selection until button is released.

(1) During PLAY mode, fast forward is carried out during pressing. Release this button to return to PLAY mode.
(2) During PAUSE mode, press this button for fast forward. Releasing button returns set to PAUSE mode.

⑫ REV (REVERSE) Button

Pickup will fast-reverse while button is depressed.

(1) During PLAY, depress to reverse. Release this button to return to PLAY mode.
(2) During PAUSE, depress to reverse. Release button to return to PAUSE mode.

- During AUTO PLAY, fast forward (reverse) is carried out in normal channel order. (By continuous pressing, music numbers which are not in the channel memory will be displayed. Releasing will start playback in direction of PLAY.)
- Speed of pickup for fast forward (reverse):
  For 0.5 second after pressing, about double normal playing speed.
  From 0.5 to 2.5 seconds after pressing, about 20 times normal playing speed.
  After 2.5 seconds, about 100 times normal playing speed.
  Thus, three speeds are provided in FAST FORWARD and REVERSE modes.

⑬ REPEAT Button

Press for ON, and press again for OFF.

(1) In MANUAL PLAY press this button to repeat play of all music selections.
(2) In AUTO PLAY, press this button to repeat play of all memorized channels.

- When the mode changes from MANUAL PLAY into AUTO PLAY or from AUTO PLAY into MANUAL PLAY, REPEAT will automatically turn OFF.

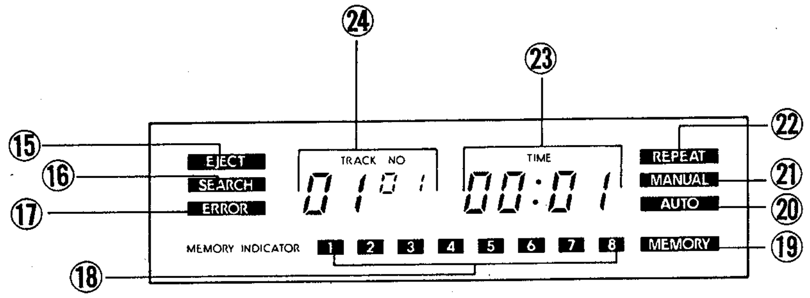
⑭ NEXT PLAY Button

Press this button during PLAY to stop play and move to the beginning of the next music selection.

(1) One press of this button during MANUAL PLAY starts play from the beginning of next music selection.
(2) One press of this button during AUTO PLAY starts play from the beginning of the memorized music selection in the next channel.

- Pressing this button twice or more plays corresponding subsequent music selection. (In AUTO PLAY, plays corresponding subsequent channel.)

INDICATORS



⑮ **EJECT Indicator**
This indicator lights up from when EJECT button is pressed until disc pocket is firmly closed.

⑯ **SEARCH Indicator**
After the TOC (Table Of Contents) in the disc is read out, this indicator lights up.

⑰ **ERROR Indicator**
In the following cases, this indicator lights up, flickering on and off, and further operation of set is impossible. (see P. 16 of this manual)
(1) When the disc is placed incorrectly.
(2) When nonexistent music number is input and PLAY or PAUSE button is pressed.

⑱ **MEMORY CHANNEL Indicators (1 ~8)**
(1) The corresponding indicators light up for the channels in which music numbers are memorized.
(2) When MUSIC SELECT button is operated, the indicator flickers on and off. (This shows that the music number can be memorized in the corresponding channel.)
(3) When the MEMORY READ button is pressed, this indicator flickers on and off. (This shows the music number of the corresponding channel. In the AUTO PLAY mode, this shows which channel the set is playing.)

⑲ **MEMORY Indicator**
When the MUSIC SELECT button is pressed, this indicator lights up. While this indicator flickers on and off (about ten seconds), music numbers can be input.

⑳ **AUTO PLAY Indicator**
During AUTO PLAY, this indicator lights up.
(Within ten seconds of pressing MEMORY READ button, press PLAY button to change mode to AUTO PLAY.)

㉑ **MANUAL PLAY Indicator**
(1) When the disc has been placed and the disc pocket is closed, this indicator flickers on and off for about five seconds to indicate that the TOC (Table of Contents) of the disc are being read out. While this indicator is lit, pressing of other buttons will be ineffective.
(2) This indicator lights up during MANUAL PLAY.

㉒ **REPEAT Indicator**
When the REPEAT button is pressed, this indicator lights up. Another press turns it off. While lit and until the REPEAT Mode is released, play continues repeatedly.

㉓ **TIME Display**

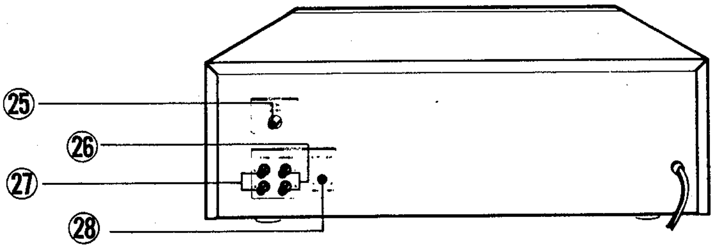
This shows the playing time. When the Track No. changes, the display returns to 00 min. 00 sec.
When a music selection is completed, this counter may show reversed time for a few seconds before the next music selection starts to play.
This indicates the pause time between music selections.

㉔ **TRACK NO. – Track No. Index No. Indicators**

TRACK NO
01 01

The two digits on the left show track number, and the two digits on the right show index number.
The index number changes each time the track number changes.
These numbers are described in the instruction booklets for the discs. See them for actual operation.

REAR PANEL



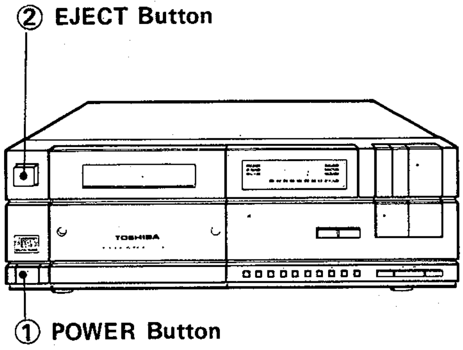
㉕ **CHIRP Button**
This button is for ON/OFF of the electronic chirp which sounds when operation buttons are pressed.
Press this button for ON and press once more for OFF Depending on your preference, hear or cancel the electronic chirp by using this button.

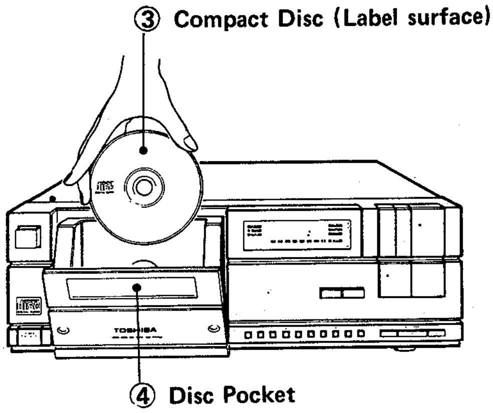
㉖ **VARIABLE Terminals**
These terminals are used for adjustment of output level by OUTPUT LEVEL knob.

㉗ **FIXED Terminals**
To connect the set to the AUX terminals (DAD/AUX terminals) of a preamplifier or an integrated amplifier.

㉘ **OUTPUT LEVEL Knob**
The output level from VARIABLE terminals can be adjusted with this knob.

1-4-2 PREPARATION FOR PLAYBACK





①Press POWER button to ON.

②Press EJECT button to open the disc pocket.

③Place the disc with label surface facing you. (Place no more than one disc.)

④Press the disc pocket by hand to close it.

- **Disc starts to rotate automatically.**

While the MANUAL Indicator flickers on and off, wait for next operation.
Flickering time is generally about five seconds.

- If the disc does not rotate, or if after rotating briefly the ERROR Indicator starts flicker on and off and the disc pocket opens, the disc is not placed correctly. Replace the disc correctly.

SEARCH and MANUAL Indicators light up, Track No. and Index No. display the first music selection, and TIME Counter displays 00 min. 00 sec.

⬇

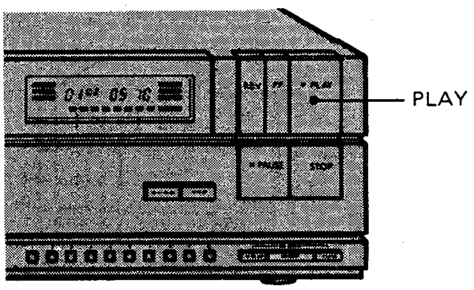
Then, move to actual play.
See instructions in this manual: from P. 10 for MANUAL PLAY, and from P. 13 for AUTO PLAY.

⬇

Ten seconds later, laser oscillation stops and the disc stops rotating, awaiting the next operation.

HOW TO PLAY (I) MANUAL PLAY
(Playback without using memory function.)

To play from the beginning to the end of a disc.



- **Press PLAY button.**

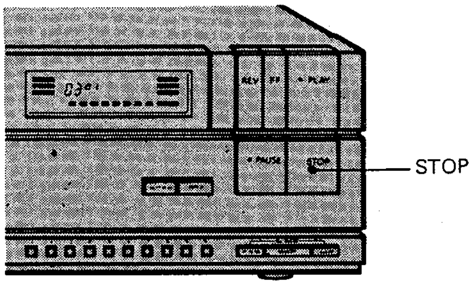
⬇

PLAY lamp lights up. Play starts from the beginning of the first music selection.
Time counter counts time beginning from 00 min. 00 sec.

⬇

When the final music selection is played back, the pickup returns to the beginning of the first music selection automatically. Laser oscillation stops ten seconds later, and disc stops rotating.

To stop play during playback

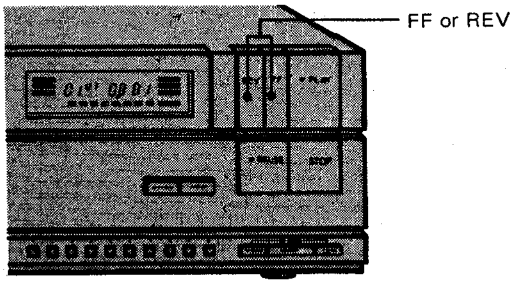


- **Press STOP Button.**

⬇

Play stops immediately. The pickup returns to the beginning of the first music selection automatically. Laser oscillation stops ten seconds later, and disc stops rotating.

To fast forward or reverse

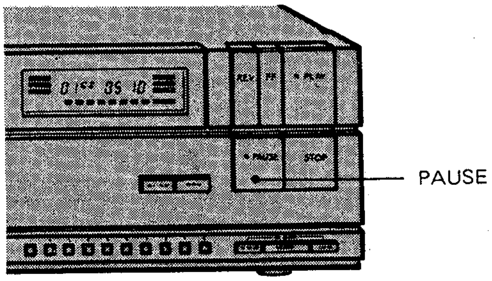


- **To advance, press FF Button. To reverse, press REV Button.**

⬇

For fast forward and reverse, there are three graded speeds. When you near desired place, press the corresponding button intermittently.

To stop temporarily (PAUSE)



- **Press PAUSE Button.**

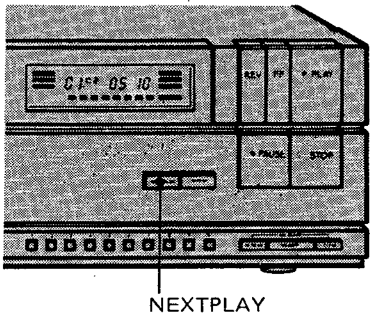
⬇

The pickup stops at the point where PAUSE button is pressed. Disc continues to rotate, and laser also continues to oscillate.

⬇

To release the mode, press PLAY Button.

To advance to the next selection during playback



- **Press NEXT PLAY Button**
- When this button is pressed more than once, the corresponding subsequent music selection will be played.

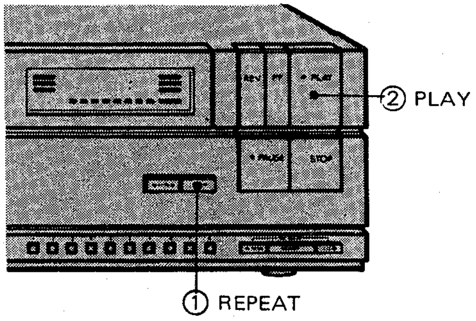
⬇

Playback stops. Display for next music number flickers on and off, and the pickup searches for the beginning of the next music selection. (PLAY lamp lights up.)
After the beginning of the next selection is located, display for music number stops flickering and remains lit, and playback of the music selection starts.

⬇

When the final music selection is played, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, laser oscillation stops and the disc also stops rotating.

To listen to the entire disc repeatedly



① Press REPEAT Button
② Press PLAY Button
- PLAY button may be pressed before REPEAT button.

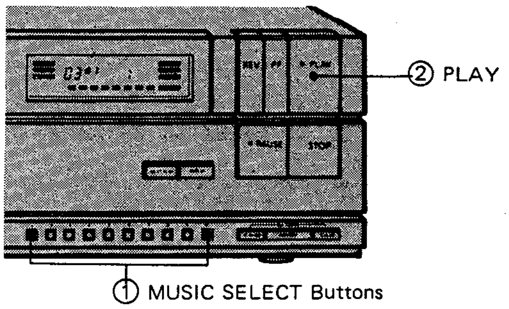
⬇

When the final music selection is played, the pickup automatically returns to the beginning of the first music selection, and starts playback again. Until this mode is cancelled, repeat play will continue.

⬇

To cancel REPEAT mode, press REPEAT button again.

To listen to a specific music selection



① Using MUSIC SELECT button, input track number of desired selection.
ex. To listen to the third music selection, press the 3 of MUSIC SELECT buttons.
(Pressing in order of 0 3 is also possible.)

② Press PLAY Button
(Press this button within ten seconds of input by MUSIC SELECT button.)
- Input of the track number can be done during playback. Input of both track number and index number is also possible.

⬇

Display of input music number flickers on and off. The pickup searches for the beginning of the third music selection. (PLAY lamp lights up.)
After the beginning of the third selection is located, the display remains lit, and playback starts.

⬇

When the last music selection is played, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, laser stops oscillation and the disc stops rotating.

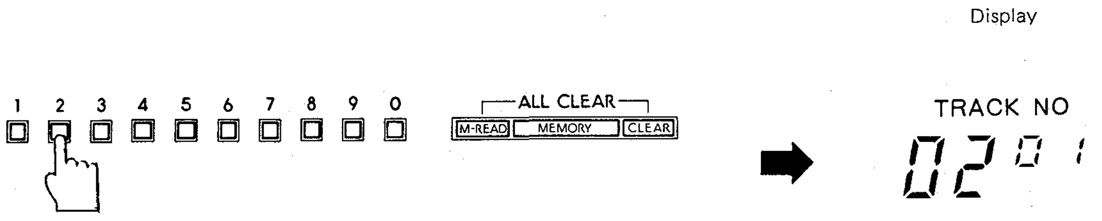
⬇

Pressing PAUSE instead of PLAY provides PAUSE at the input music number.

OPERATION OF MUSIC SELECT BUTTON

- Pressing of buttons is confirmed by electronic beep or display.

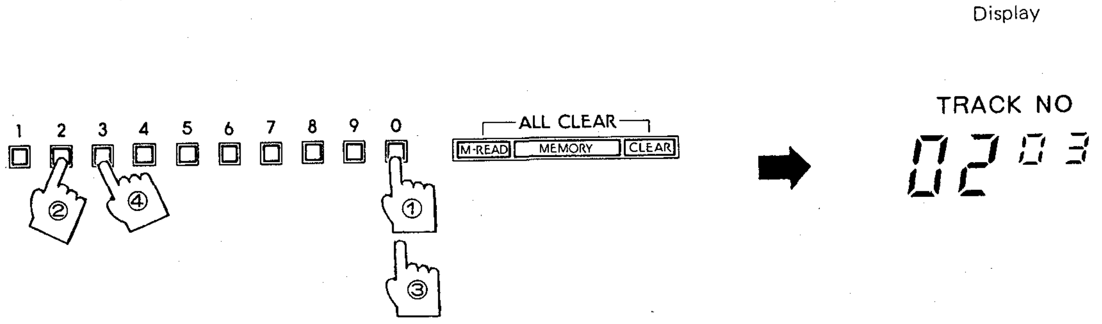
Ex. 1 Input Track No. 2


Display
1 2 3 4 5 6 7 8 9 0
ALL CLEAR
M-READ
MEMORY
CLEAR
TRACK NO
02 01

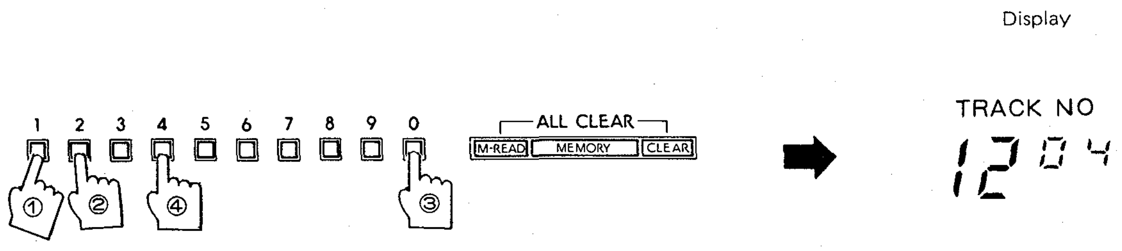
- You can also press in order of 0 2.

Ex. 2 Input Track No. 2 and Index No. 3

- In this case, because the Track No. is one digit, 0 must be pressed first.


Display
1 2 3 4 5 6 7 8 9 0
ALL CLEAR
M-READ
MEMORY
CLEAR
②
④
①
③
TRACK NO
02 03

Ex. 3 Input Track No. 12 and Index No. 04


Display
1 2 3 4 5 6 7 8 9 0
ALL CLEAR
M-READ
MEMORY
CLEAR
①
②
④
③
TRACK NO
12 04

- If the wrong button is pressed, press CLEAR button. Then input correct music number.

- **TRACK NO.**
  This is also called Music Number. Each music selection on the disc has its number, and these are described on the table of contents of the discs.
  Using the Track Nos. perform operations such as memory and selection start location. (Sometimes called TNO.)
  Track numbers are designated in order from 01 to 99. But, sometimes a disc will begin from a number other than 01 (such as 03 or 04).

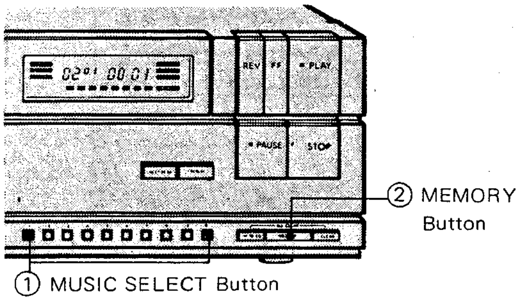
- **INDEX NO.**
  This is used to further divide contents of one music track into several parts. For example, classical music selections are divided by movement or theme, each receiving an index number within the track. For technological reasons, some DAD players do not have the index number function, but with Toshiba's XR-Z90, memory or selection start locating by index number is always available. Full use of this function will increase your listening enjoyment.

- **TIME**
  The time display shows playing time of the track number by minutes and seconds. Thanks to quartz lock, the time is always accurate.

HOW TO PLAYBACK (II) (AUTO PLAY)

How to Use the Memory Function —— Steps for AUTO PLAY ——
This is a convenient function for playing back music in any order you wish by changing the order of selections originally recorded on the disc.
It is called AUTO PLAY.

To input memory



① **Input your desired music number using MUSIC SELECT buttons.**
The MEMORY Indicator lights up, and the corresponding channel indicator flickers on and off.

② **While the MEMORY Indicator is lit, press MEMORY button.**
Then MEMORY indicator goes off, and channel indicator corresponding to input selection lights up. With this memory is completed.

Ex.

Track No.	Index No.	MUSIC SELECT Button
0 3 in channel 1	——	Press 0 3 . Then press MEMORY button
1 1 in channel 2	——	Press 1 1 . Then press MEMORY button
0 4 in channel 3	0 3	Press 0 4 0 3 . Then press MEMORY button
0 8 in channel 4	0 2	Press 0 8 0 2 . Then press MEMORY button

* Memory of up to eight channels is possible.

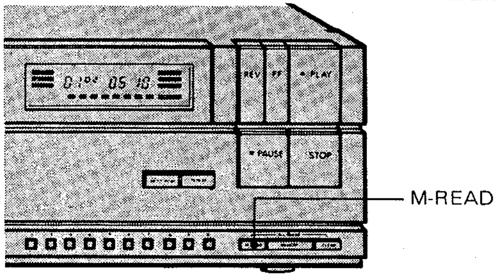
Memory can be carried out during playback without interrupting play. Even when there is no disc in pocket, if power is ON, memory can be input. (This operation cannot be carried out while the MANUAL Indicator is flickering.)

If a wrong MUSIC SELECT button is pressed, press CLEAR button. The content which is displayed will be cancelled. Other contents are stored.

Again press correct MUSIC SELECT button to input.

(When power is off, memory is stored for two or three days.)

How to confirm the music numbers in memory

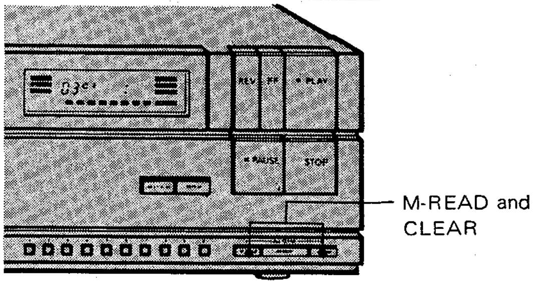


- **Press M-READ Button.**

The corresponding channel indicator lights up and flickers for ten seconds, showing the music number which has been memorized in the channel.

For confirmation of the next channel, again press the M-READ button.

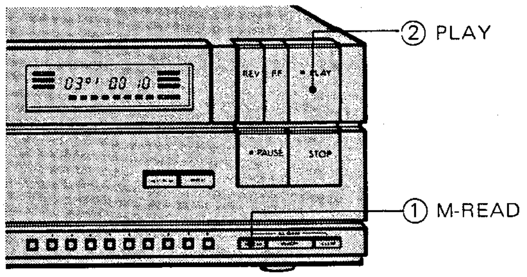
How to cancel memory



- **Press M-READ Button and CLEAR Button simultaneously.**

Memories in all channels are cancelled. (Channel indicator also turns off.)
- **Caution:** It is not possible to cancel one specific channel only.

Listening to memorized channels in order



① Press M-READ button until the desired channel indicator flickers.
② Press PLAY button.

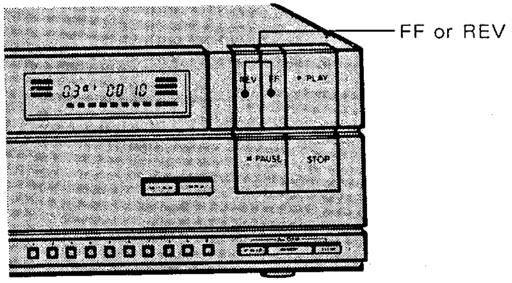
⬇

The music number display flickers, and the pickup looks for the corresponding music number, which has been memorized in that channel. (AUTO indicator lights up.) After the music number is located, display for music number stops flickering and remains lit. Playback starts.

⬇

After the final selection in memory has been played, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, the laser oscillation stops, and disc stops rotating.

To fast forward or reverse during playback



- **To fast forward, press FF button. To reverse, press REV button.**

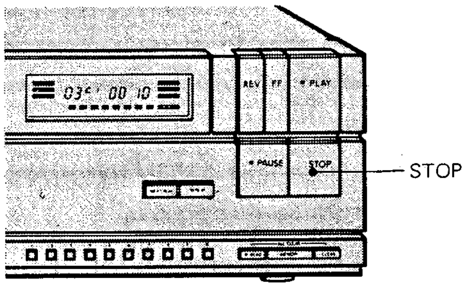
⬇

Pickup moves in order of memorized channels (forward or reverse)

⬇

There are three graded speeds for fast forward and reverse. When the desired part approaches, press the button intermittently until pickup reaches desired point.

To stop playback

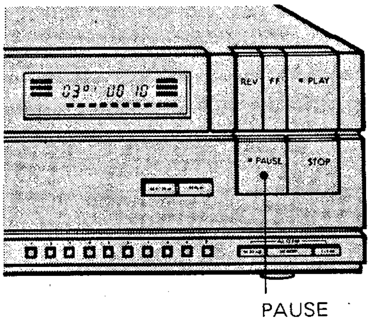


- **Press STOP button.**

⬇

Playback stops. The pickup automatically returns to the beginning of the first music selection. Ten seconds later, the laser oscillation stops, and the disc stops rotating.

To stop temporarily (PAUSE)



- **Press PAUSE button.**

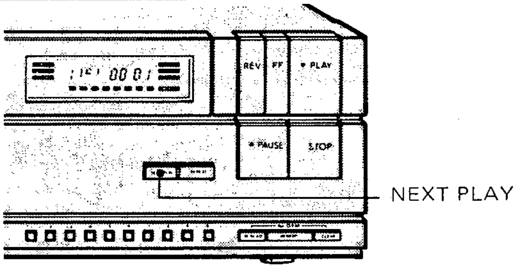
⬇

The pickup stops at the point where PAUSE button is pressed. The disc continues to rotate and laser oscillation also continues.

⬇

To release, press PLAY button.

To advance to the next selection during playback



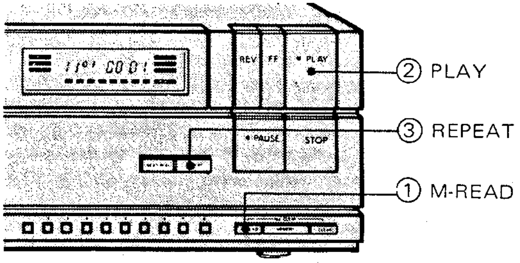
- **Press NEXT PLAY button.**

- Press this button more than once and the corresponding subsequent music selection will be played.

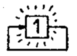
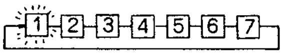
Playback stops. Display for the next channel flickers on and off. The pickup looks for the corresponding music number which has been memorized in the channel.
After selection is located, the display remains lit. Playback starts.

After the final memorized music selection has been played, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, the laser oscillation stops, and the disc stops rotating.

To listen to the memorized channels repeatedly



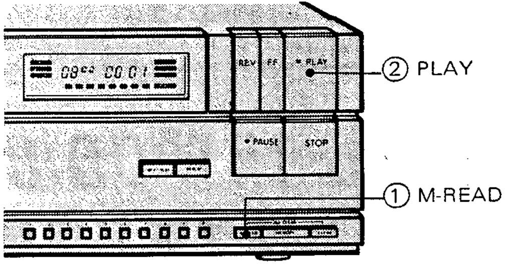
① **Press M-READ button until the channel indicator which you desire flickers on and off.**
② **Press PLAY button.**
③ **Press REPEAT button.**

If only one channel has been memorized.	If several channels have been memorized.
	
(Repeat of just one channel)	(Repeat of all memorized channels)

After the final music has finished, the pickup automatically returns to the beginning of the first music selection, and playback starts again. Until the mode is cancelled, this cycle is repeated.

To cancel the mode, press REPEAT button again.

To listen to a specific channel



① **Press M-READ button until the channel indicator of the desired channel flickers on and off.**
② **Press PLAY button.**

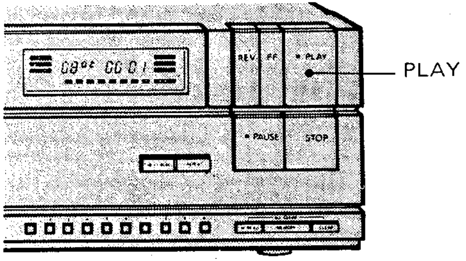
- Choice of the channel can be made during playback.

Specified channel's music number display flickers on and off. The pickup locates the corresponding memorized music number, after which the display stops flickering and remains lit. Playback starts.

After the final memorized music selection is played, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, the laser oscillation stops, and the disc stops rotating.

Pressing PAUSE button instead of PLAY will result in a temporary stop at the specified channel.

To change from AUTO PLAY to MANUAL PLAY



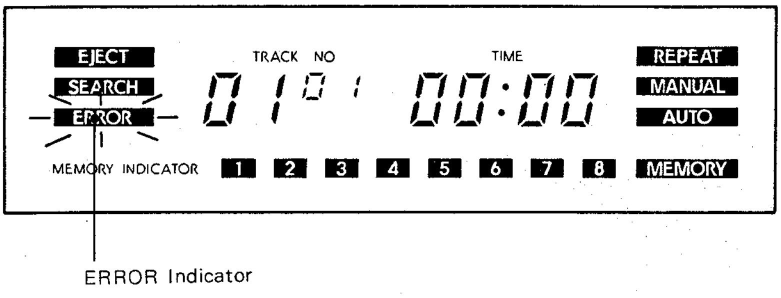
- **Press PLAY button.**

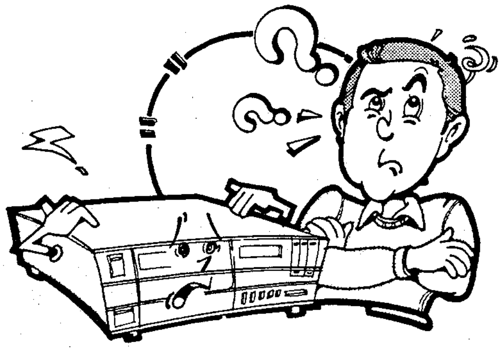
AUTO indicator turns off, and MANUAL indicator lights up. The set plays through to the final music in the disc.

Only the memorized channels are played and at the end of the last music selection, the pickup automatically returns to the beginning of the first music selection. Ten seconds later, the laser oscillation stops, and the disc stops rotating.

1-4-3 WHEN THE ERROR IS INDICATED

- **Any one of the following conditions will cause the ERROR indicator to flash. Check each item.**



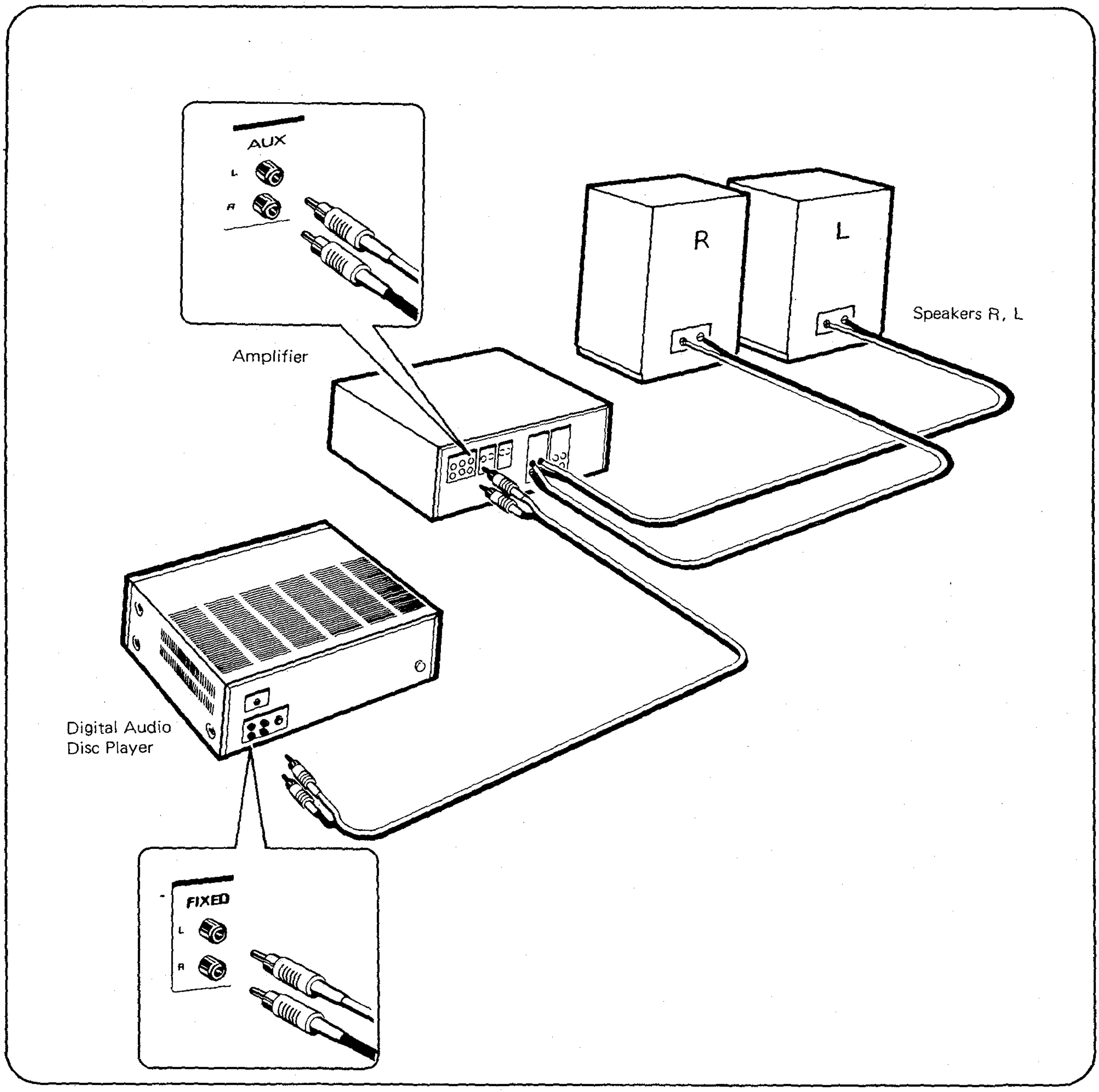


Symptoms	Reasons	Conditions and Treatment
After disc is placed and disc pocket closed, the ERROR indicator flickers.	① Disc is placed reversely. ② Disc surface is dirty. ③ Laser pickup is moist.	① Disc pocket opens automatically. Place the disc with label surface to your side. ② Disc pocket opens automatically. Clean the disc surface and replace it. ③ Moisture causes laser beam to be reflected irregularly, and the signal cannot be transmitted correctly. Wait for about one hour with the power ON.
After input of Track No., when PLAY or PAUSE button is pressed, the ERROR indicator flickers on and off.	Attempt has been made to input Track No. which does not exist on the disc.	Read the table of contents of the disc carefully, and confirm the correct Track No. Input correct Track No.
After input of Track No. and Index No., and when pressing PLAY or PAUSE button, the display flickers on and off, and then ERROR indicator starts to flicker.	Index No. does not exist on the disc.	Read the table of contents of the disc carefully, and confirm the correct Index No. Input correct Index No.
During AUTO PLAY, the indicator starts to flicker on and off.	Track No. or Index No. not on the disc is in memory, and play command is sent to the corresponding music number.	The music selection progresses one by one until the end without playing. Read the table of contents of the disc carefully, and confirm Track No. and Index No. Input into memory.
When MEMORY button is pressed, the ERROR indicator starts to flicker.	Attempting memory of Track No. 0 0 (non-extistent).	Confirm Track No. and input correct Track No.

1-4-4 CONNECTIONS

Cautions

- Before connecting the set to amplifier, turn the amplifier off.
- Connect the plugs firmly. If the connection is not made firmly, static noise may occur
- Connect correctly the left (L) and right (R) channels.



■ Connection to the Amplifier

(FIXED) Terminal

With attached connection cord (stereo PIN cord), connect the set to the (AUX) terminals or (DAD/AUX) terminals of the preamplifier or integrated amplifier.

(VARIABLE) Terminal

From this terminal, direct connection to the input terminals of a power amplifier is possible.

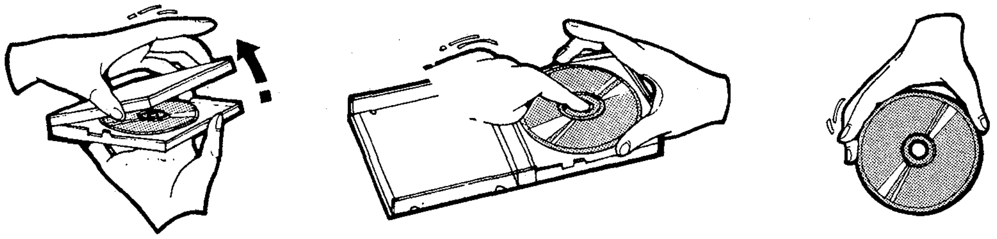
When the unit is connected to an integrated amplifier, lower the output level by (OUTPUT LEVEL) control knob.

(To about the eleven o'clock position)

1-5 HANDLING OF THE COMPACT DISC

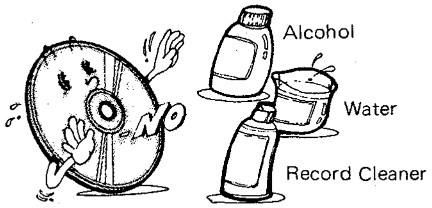
Pay attention to the following items when handling the disc.

Cautions for handling of discs

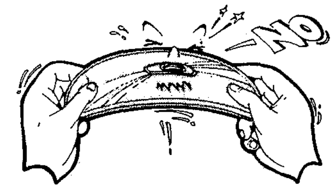


Opening of the disc case and removeing the disc.

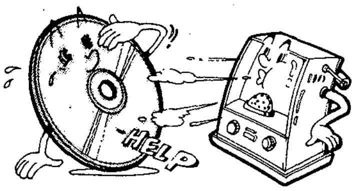
- Do not clean the disc with alcohol, water, conventional record cleaner, or anti-electrostatic chemicals.



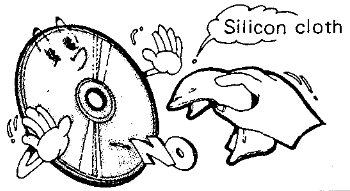
- Do not bend.



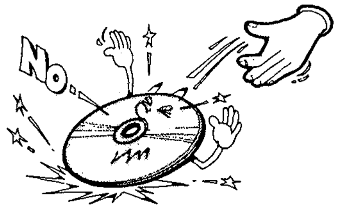
- Avoid excessive heat.



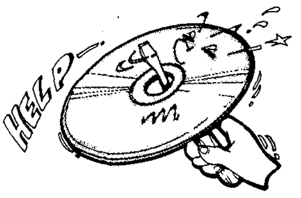
- Do not clean with silicon cloth.
  If the disc become dirty, clean with soft cloth only.



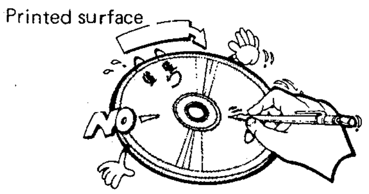
- Do not damage, hit or scratch the disc.



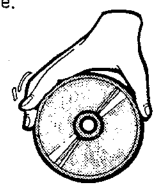
- Do not enlarge center hole.



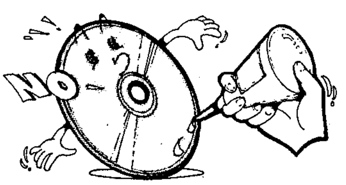
- Do not write on label surface (printed surface).



- How to hold the disc.
  As shown in the illustration, hold the disc so as to avoid fingerprinting its surface.



- Do not get finger prints, oil or dirt on the disc. If the disc becomes dusty, clean with a soft cloth.

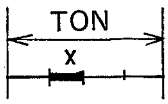


- Care of the disc
  Do not keep the disc in a place which has high temperature or humidity. Otherwise, the disc may become warped.
  When the disc is exposed to direct sunshine for long hours, it will also become warped. For long disc life, please keep the disc inside its case.

1-6 NONSENSE CALL (If it seems like faulty, check again)

Symptom	Main Cause	Remedy and Check
1. The flashing of indication lasts 20 seconds and the disc is rejected.	• DISC upside down.	• Insert the disc facing the label side toward you.
2. The ERROR indicator lights up.	• DISC upside down.	• Insert the disc facing the label side toward you.
	• TNO which is not on DISC was entered.	• Enter a proper TNO or INDEX reading through instructions on DISC. In case when TNO is a one-digit datum, enter figure 0 before the digit.
	• Fixing screw for transportation is not removed.	• Remove the fixing screw.
3. TNO does not enter properly. (Memory does not function.)	• Switch is not properly depressed.	• Confirm beep sound is heard when switch is pushed rightly or TNO is displayed on display tube.
	• Numbers displayed previously still remain.	• A datum should be keyed in after depressing the clear button once.
	• Misoperation when entering one-digit TNO and INDEX.	• Whenever TNO is of one digit, push button 0 first and then immediately enter INDEX.
4. INDEX does not enter properly. (Memory does not function.)	• You try to enter only INDEX.	• Entry of only INDEX cannot be allowed. You have to always enter along with TNO. TNO should be first entered.
	• Notwithstanding that TNO is of one digit, button 0 is not pressed.	• Whenever TNO is of one digit, first press ZERO, then enter TNO and yet INDEX.
5. Sound is not heard with a DISC loaded.	• PLAY button is not pushed.	• If failing to continue press of button PLAY for 10 seconds even when indication has been changed from flashing to steady lighting, it is automatically put into pause. Press button PLAY.
	• Connection is made to VARIABLE output plug and a level adjuster is fully attenuated.	• Place the level adjuster at around 11 o'clock position.
6. Picture does not come out.	• Misunderstanding and confusion with Vidio Disc.	• Please explain that CD does not present pictures and is only for delivering sounds.

Symptom	Main Cause	Remedy and Check
7. DISC together with the case cannot be entered.	• Misunderstanding and confusion with VD.	• Please explain that CD must be taken out of the case and entered with the label side facing toward you.
8. DISC is running even at pause.	• Normal	• Unlike cassette deck, its rotation is held because pause is made for a fixed time indication.
9. Sound is distorted somewhat.	• Connection is made from VAR jacks to AUX jacks with the VOLUME set to maximum level.	• Signal overload to AMP input. Lower the level properly.
	• DISC is dirted with finger prints and oil stains.	• Wipe them out with dry, soft cotton cloth.
	• DISC surface is scratched.	• Replace the DISC with a new one.
	• Connection is made to PHONO plug of AMP.	• Reconnect it to AUX plug. Since the output is a 150mV-in-average flat output, it is too large for PHONO plug.
	• Label surface of DISC is damaged with some hard thing such as a ballpoint pen.	• Because there is a thin protective film between a label surface and a pit surface, it is vulnerable. Replace the DISC with a new one.
10. Sound is emitted when pressing the switch.	• CHIRP switch is on.	• Turn over the switch on the rear side according to your taste. The sound will be eliminated with the switch turned OFF.
11. FF and REV do not work.	• Letting a switch push instead of continuing press makes automatic change to PLAY.	• When continuing press of FF or REV switch, the speed is varied for three steps. Taking account of this function, you can learn the technique to lead to a destination.
12. Time indication is out of order.	• Normal	• This time does not represent an o'clock but indicates the data read out from the DISC.
13. Search time is varied, shorter or longer. (Search means an operation to find out a desired music.)	• Faulty DISC	• When a signal read out of DISC includes a great deal of noises, readout is conducted many times until a correct signal is attained, so it takes much time.
	• A desired music is located in a remote position.	• Because a pickup (PU) is moved to a destination by an instruction of circuit, reaching a music recorded in a remote location takes much longer time, and a music in a near location takes much shorter time.

Symptom	Main Cause	Remedy and Check
	• A desired music is located in a remote position. • INDEX rather than 01 is entered.	• Because a pickup (PU) is moved to a destination by an instruction of circuit, reaching a music recorded in a remote location takes much longer time, and a music in a near location takes much shorter time. • INDEX is hard to be found out.
14. Sound is emitted from the set at search mode.	• It is not faulty.	• It will stop when a desired music has been found out. This is the sound at PU's movements or the sound at movements of the lens within PU.
15. Search time is too long.	• SEARCH indicator does not light up. • If the DISC has only one TNO and it is split by X, this operation is normal.	• There is no way to make it shorter. This is because that scratches or dusts are on the disc so that TOC cannot be read out. For the sake of carefulness, wipe it clearly out with cotton cloth and replay it. • The search by X takes much longer time than in the search by TNO. The reason is that the address of X is not on the disc so that the search is in fact conducted on the disc surface.
16. Only X in the midst of some TNOs is not heard.	• Normal	• Search for only X as shown in the figure can not be made.  Only the search as shown by the arrow markings can be allowed.
17. Function does not start even pressing the swtich.	• The system does not response while indication is flashing. • EJECT is lit, and the door is closed.	• The flashing indication represents that some action is not completed, so that a following instruction is not accepted. Depress the switch after indication is lit steadily. • The cause seems to be that the door is pushed during EJECT. Since the door is not opened, the action is not completed, being the same as the above cause. Depress button EJECT again to open the door once and redo it.
18. READY OK is not obtained even inserting a DISC, and the DISC is ejected.	• DISC upside down. • Stains on the disc's surface are terrible.	• Reinsert the DISC with the label side facing toward you. The printed side is the label side. • Wipe them out with cloth lightly. Strong wiping would cause scratches.

Symptom	Main Cause	Remedy and Check
	• Dews are deposited on the lens of a laser PU.	• This is the reason why a laser beam is irregularly reflected on attached dews so that a signal is not correctly conveyed. Wait for around one hour after switching the power on, and operate it.
19. Sound is skipped.	• There are scratches on the DISC.	• Unfortunately, there is no measure on the set side. Be careful not so as to develop further scratches on the disc.
	• Dusts and stains are deposited on the DISC.	• Wipe them out clearly.
	• Is vibration applied on the set?	• Severe vibration or shock would overpower the tracking capability. Warn against vibration.
	• The set is not installed horizontally.	• Put the set horizontally. It should be kept horizontally in order to move a laser PU at a high speed.
	• Don't push a DISC pocket.	• If pushing or pulling a dis pocket during playing, the rotation could be out of order. Open/Close of the disc pocket must be conducted via EJECT.
20. Fixing screw for transportation cannot be reused because of failing to meet its old hole.	• The PU is not at the original point so that hole does not fit the threaded hole.	• Pressing button STOP, the indication is lit. (0101) Then, turn off the power.
21. The life of PU is short.	• Operation in a high-temperature room.	• Use the set in a low-temperature place. Move it to a place lower than 30°C for good ventilation. Avoid to put it on an amplifier.
	• Adjustment of VR was upset accidently.	• Adjust so that a laser beam of 0.3mW is emitted. Recheck if a resistor matching its class is used.
	• Life is over?	• When the output of 0.3mW is not obtained with the drive current higher than 130mA, LD's lifie is over. Ask your dealer to repair it.
	• The set is used in a closed rack.	• Replace it to an open-type rack to lower the ambient temperature.

Symptom	Main Cause	Remedy and Check
	● Some electric appliance which emits sparks is put nearby.	● Insert a power line filter. Use a power at a different plug. Place the set away from the appliance emmitting sparks. In addition to these measures, direct shock against the laser diode should by prevented to ensure a longer-life operation.
22. DISC is turning with a rattling rub at Open/Close of the DISC pocket.	● The pocket is slowly closed.	● Close the pocket at a usual speed. When it's speed is too small, the margin time of circuit is over, and the motor runs.
	● The pocket is opened just after turning the power OFF.	● DISC will stop a few seconds after switching OFF the power. Then press button EJECT.
23. The set tilts because of different legs.	● An amplifier or other things are mounted on the player.	● Don't put anything on the player. An insulator is provided to achieve stronger structure against shocks. Mounting a heavy thing thereon could lead to tilt, fall, etc., causing degradation of the performance.
24. Noises are introduced into a tuner.	● Tuner or tuner antenna is place close to the player.	● Reinstall tuner or turner antenna properly far away from the player or turn the player power off.

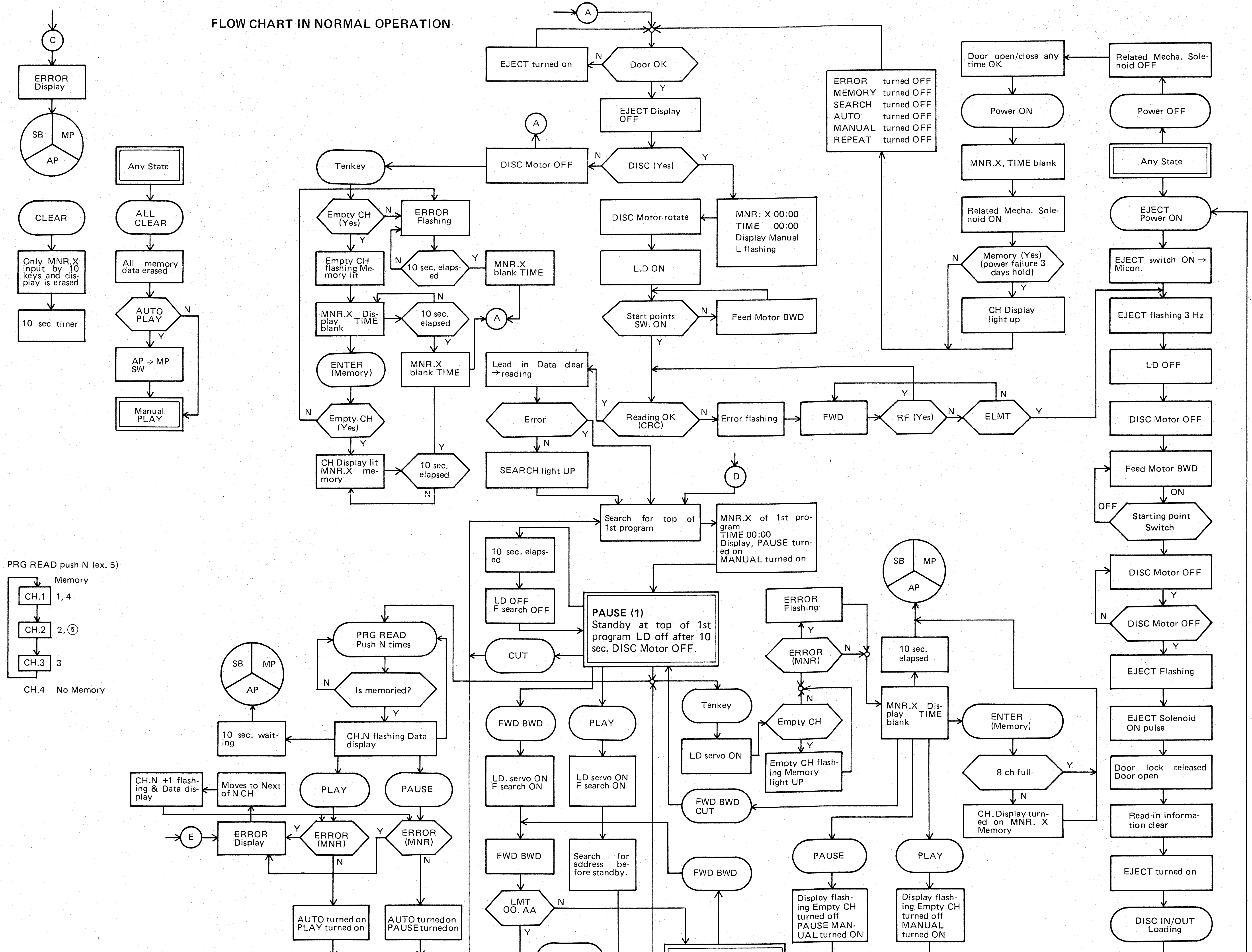
[2] TROUBLE SHOOTING

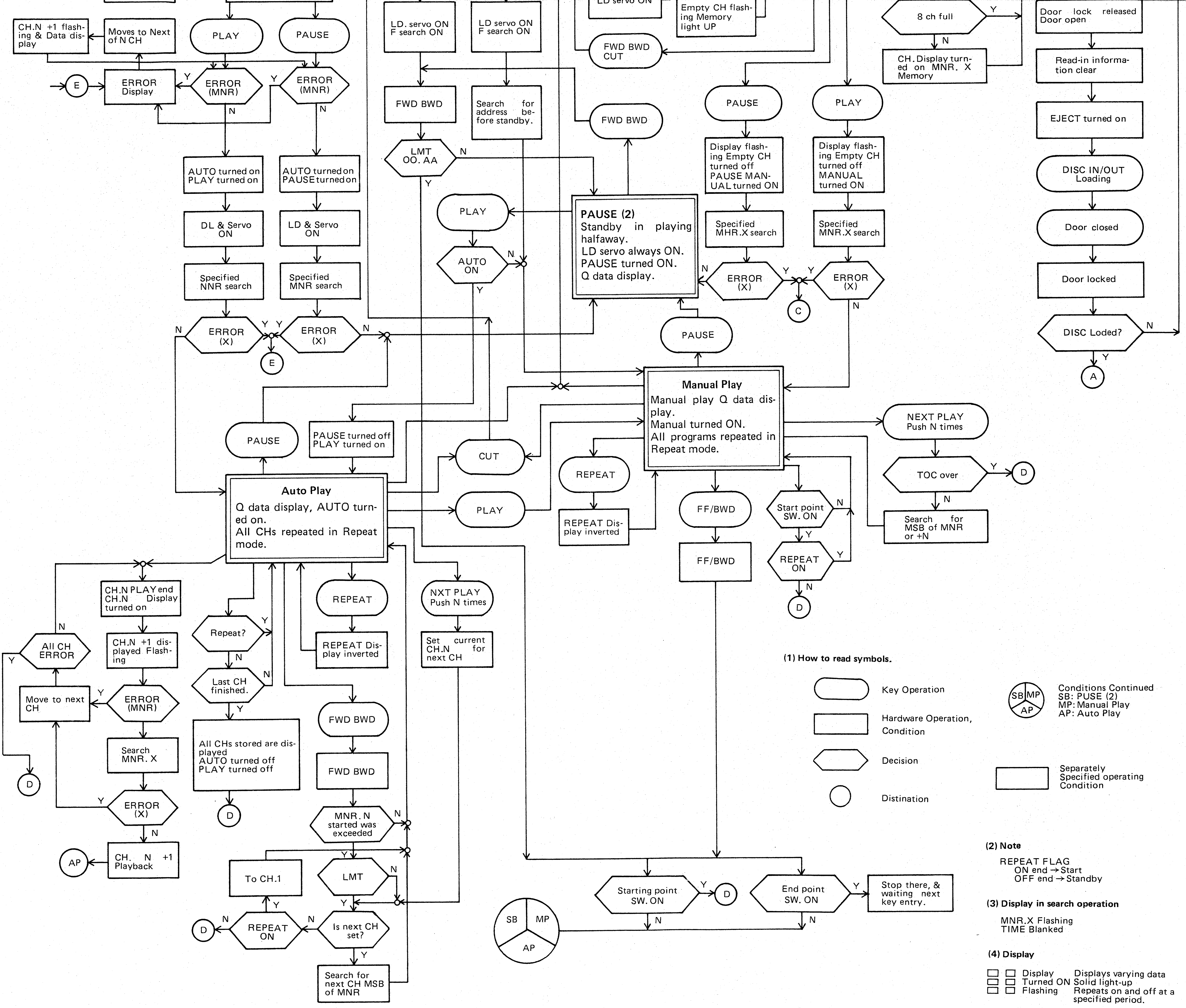
[2-1] GENERAL

The XR-Z90 is a new CD player developed by introducing entirely new technological concepts and includes the most advanced electronic circuits consisting of more than 1000 electronic components. Consequently, it may be difficult to locate failure parts in servicing. To find the failure parts more speedily with less tampering, various flow charts and waveforms in normal circuit operations have been provided for your reference in servicing.

First, try to operate the unit according to the exact procedures specified in the "Troubleshooting Flowchart".
When you encounter a question or failure symptom in proceeding the steps, read the reference or failure remedy index written in " [ ] " just located right hand side of the check item, and jump to the section shown by the index. Compare the waveform at that circuit with the normal reference waveform shown in the section, and failure(s) will be found easily.

FLOW CHART IN NORMAL OPERATION


C
ERROR Display
SB
MP
AP
CLEAR
Only MNR.X input by 10 keys and display is erased
10 sec timer
Any State
ALL CLEAR
All memory data erased
AUTO PLAY
N
Y
AP → MP SW
Manual PLAY
PRG READ push N (ex. 5)
Memory
CH.1
1, 4
CH.2
2, ⑤
CH.3
3
CH.4
No Memory
A
EJECT turned on
Door OK
EJECT Display OFF
DISC Motor OFF
DISC (Yes)
Tenkey
Empty CH (Yes)
ERROR Flashing
Empty CH flashing Memory lit
10 sec. elapsed
MNR.X blank TIME
MNR.X Display TIME blank
10 sec. elapsed
ENTER (Memory)
MNR.X blank TIME
Empty CH (Yes)
CH Display lit MNR.X memory
10 sec. elapsed
DISC Motor rotate
MNR: X 00:00
TIME 00:00
Display Manual
L flashing
L.D ON
Start points SW. ON
Feed Motor BWD
Lead in Data clear → reading
Error
SEARCH light UP
Reading OK (CRC)
Error flashing
FWD
RF (Yes)
ELMT
D
Search for top of 1st program
MNR.X of 1st program TIME 00:00 Display, PAUSE turned on MANUAL turned on
10 sec. elapsed
LD OFF F search OFF
PAUSE (1) Standby at top of 1st program LD off after 10 sec. DISC Motor OFF.
CUT
PRG READ Push N times
Is memoried?
CH.N flashing Data display
10 sec. waiting
CH.N +1 flashing & Data display
Moves to Next of N CH
PLAY
PAUSE
E
ERROR Display
ERROR (MNR)
ERROR (MNR)
AUTO turned on PLAY turned on
AUTO turned on PAUSE turned on
FWD BWD
PLAY
LD. servo ON F search ON
LD servo ON F search ON
FWD BWD
Search for address before standby.
LMT 00. AA
Tenkey
LD servo ON
Empty CH
Empty CH flashing Memory light UP
FWD BWD CUT
FWD BWD
ERROR Flashing
ERROR (MNR)
10 sec. elapsed
MNR.X Display TIME blank
ENTER (Memory)
8 ch full
CH. Display turned on MNR. X Memory
PAUSE
Display flashing Empty CH turned off PAUSE MANUAL turned ON
PLAY
Display flashing Empty CH turned off MANUAL turned ON
ERROR turned OFF
MEMORY turned OFF
SEARCH turned OFF
AUTO turned OFF
MANUAL turned OFF
REPEAT turned OFF
Door open/close any time OK
Power ON
MNR.X, TIME blank
Related Mecha. Solenoid ON
Memory (Yes) (power failure 3 days hold)
CH Display light up
Related Mecha. Solenoid OFF
Power OFF
Any State
EJECT Power ON
EJECT switch ON → Micon.
EJECT flashing 3 Hz
LD OFF
DISC Motor OFF
Feed Motor BWD
ON
OFF
Starting point Switch
DISC Motor OFF
DISC Motor OFF
EJECT Flashing
EJECT Solenoid ON pulse
Door lock released Door open
Read-in information clear
EJECT turned on
DISC IN/OUT Loading


CH.N +1 flashing & Data display
Moves to Next of N CH
PLAY
PAUSE
LD. servo ON F search ON
LD servo ON F search ON
LD servo ON
Empty CH flashing Memory light UP
FWD BWD CUT
8 ch full
Y
N
CH. Display turned on MNR. X Memory
Door lock released Door open
Read-in information clear
EJECT turned on
DISC IN/OUT Loading
Door closed
Door locked
DISC Loded?
A
E
ERROR Display
ERROR (MNR)
ERROR (MNR)
FWD BWD
Search for address before standby.
FWD BWD
PAUSE
PLAY
LMT 00. AA
Display flashing Empty CH turned off PAUSE MANUAL turned ON
Display flashing Empty CH turned off MANUAL turned ON
AUTO turned on PLAY turned on
AUTO turned on PAUSE turned on
PLAY
PAUSE (2)
Standby in playing halfaway.
LD servo always ON.
PAUSE turned ON.
Q data display.
Specified MHR.X search
Specified MNR.X search
DL & Servo ON
LD & Servo ON
AUTO ON
ERROR (X)
ERROR (X)
C
Specified NNR search
Specified MNR search
ERROR (X)
ERROR (X)
PAUSE
Manual Play
Manual play Q data display.
Manual turned ON.
All programs repeated in Repeat mode.
NEXT PLAY Push N times
TOC over
D
Search for MSB of MNR or +N
PAUSE
PAUSE turned off PLAY turned on
CUT
REPEAT
REPEAT Display inverted
FF/BWD
FF/BWD
Start point SW. ON
REPEAT ON
Auto Play
Q data display, AUTO turned on.
All CHs repeated in Repeat mode.
PLAY
CH.N PLAY end CH.N Display turned on
Repeat?
REPEAT
NXT PLAY Push N times
Set current CH.N for next CH
All CH ERROR
CH.N +1 displayed Flashing
Last CH finished.
REPEAT Display inverted
Move to next CH
ERROR (MNR)
All CHs stored are displayed AUTO turned off PLAY turned off
FWD BWD
FWD BWD
Search MNR. X
ERROR (X)
MNR. N started was exceeded
AP
CH. N +1 Playback
To CH.1
LMT
Is next CH set?
REPEAT ON
Search for next CH MSB of MNR
SB
MP
AP
Starting point SW. ON
End point SW. ON
Stop there, & waiting next key entry.

(1) How to read symbols.

Key Operation

Hardware Operation, Condition

Decision

Distination

SB MP AP Conditions Continued
SB: PUSE (2)
MP: Manual Play
AP: Auto Play

Separately Specified operating Condition

(2) Note

REPEAT FLAG
ON end → Start
OFF end → Standby

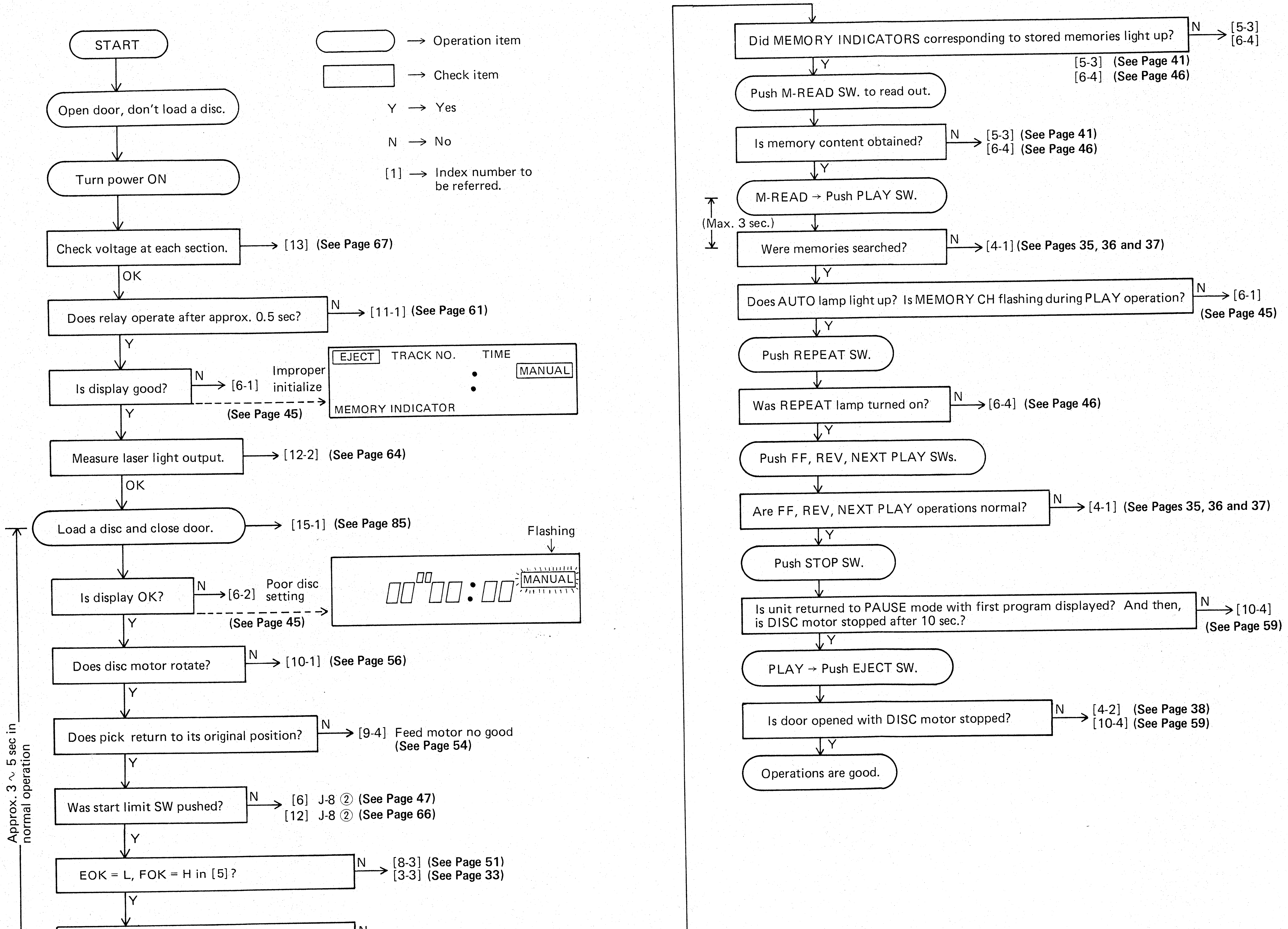
(3) Display in search operation

MNR.X Flashing
TIME Blanked

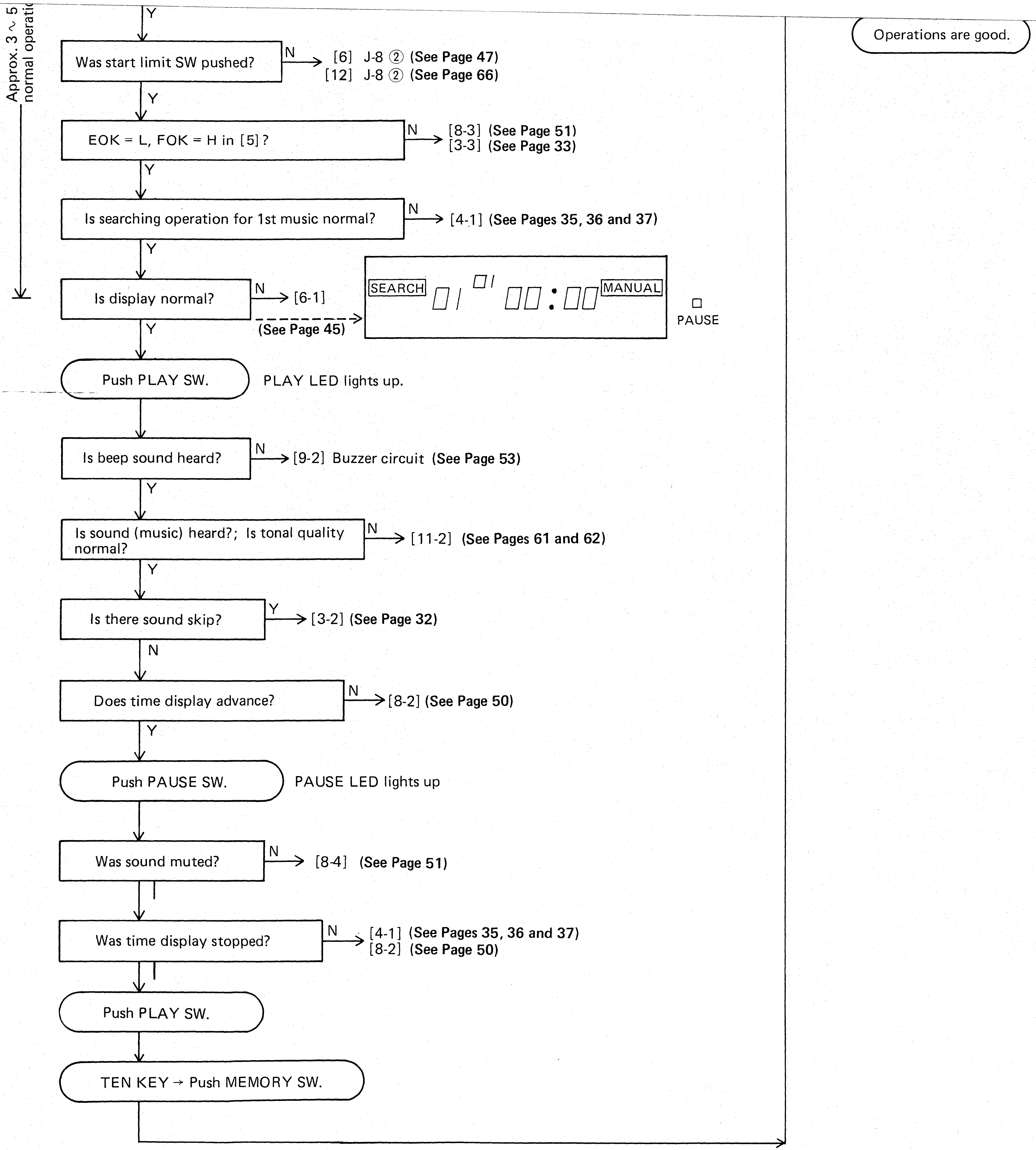
(4) Display

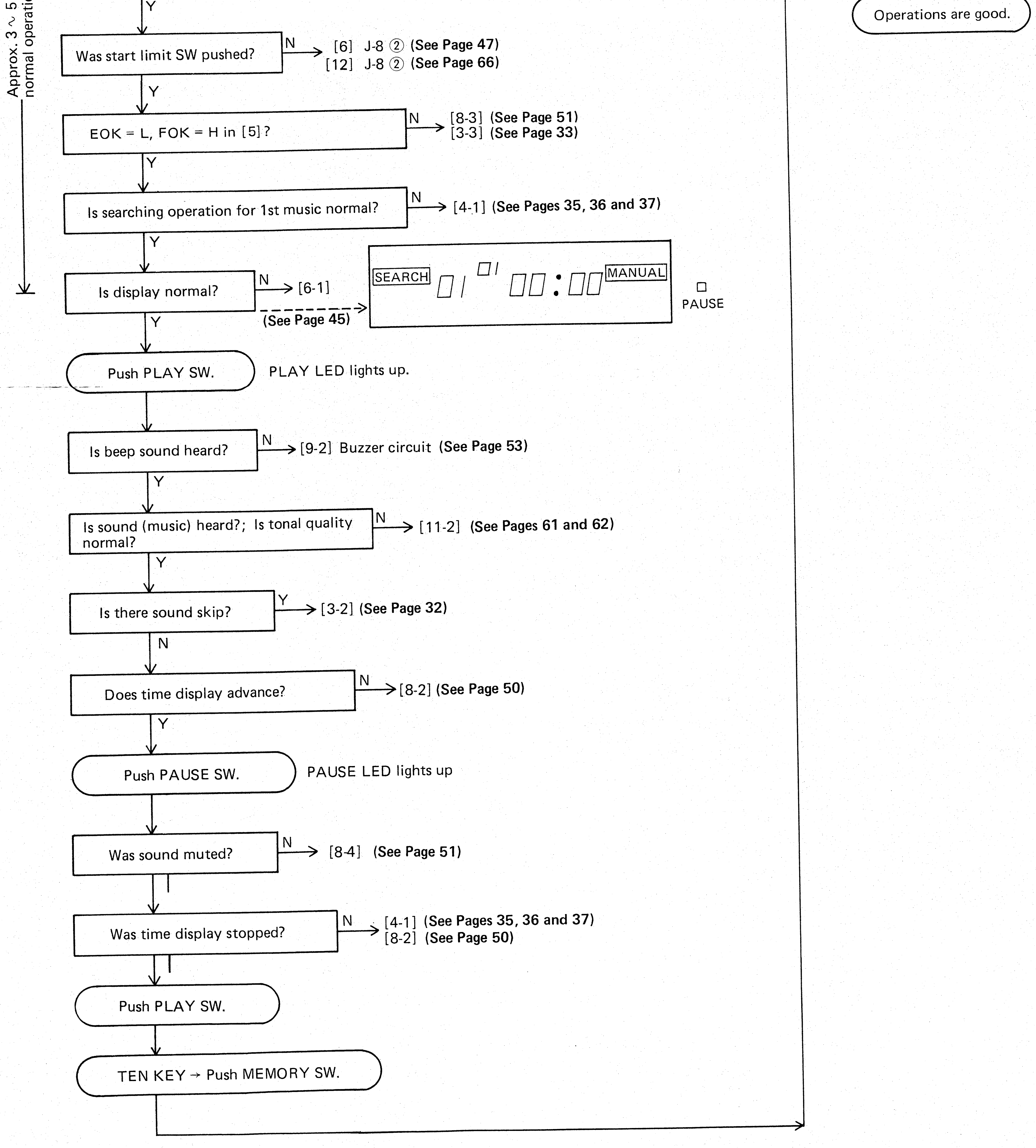
☐ ☐ Display	Displays varying data
☐ ☐ Turned ON	Solid light-up
☐ ☐ Flashing	Repeats on and off at a specified period.

TROUBLESHOOTING FLOWCHART



Operation item
Check item
Y → Yes
N → No
[1] → Index number to be referred.
START
Open door, don't load a disc.
Turn power ON
Check voltage at each section.
[13] (See Page 67)
OK
Does relay operate after approx. 0.5 sec?
N
[11-1] (See Page 61)
Y
Is display good?
N
[6-1]
Improper initialize
(See Page 45)
EJECT
TRACK NO.
TIME
MANUAL
MEMORY INDICATOR
Y
Measure laser light output.
[12-2] (See Page 64)
OK
Load a disc and close door.
[15-1] (See Page 85)
Flashing
Is display OK?
N
[6-2]
Poor disc setting
(See Page 45)
00 00 : 00
MANUAL
Y
Does disc motor rotate?
N
[10-1] (See Page 56)
Y
Does pick return to its original position?
N
[9-4] Feed motor no good (See Page 54)
Y
Was start limit SW pushed?
N
[6] J-8 ② (See Page 47)
[12] J-8 ② (See Page 66)
Y
EOK = L, FOK = H in [5]?
N
[8-3] (See Page 51)
[3-3] (See Page 33)
Y
Approx. 3 ~ 5 sec in normal operation
Did MEMORY INDICATORS corresponding to stored memories light up?
N
[5-3]
[6-4]
[5-3] (See Page 41)
[6-4] (See Page 46)
Y
Push M-READ SW. to read out.
Is memory content obtained?
N
[5-3] (See Page 41)
[6-4] (See Page 46)
Y
M-READ → Push PLAY SW.
(Max. 3 sec.)
Were memories searched?
N
[4-1] (See Pages 35, 36 and 37)
Y
Does AUTO lamp light up? Is MEMORY CH flashing during PLAY operation?
N
[6-1]
(See Page 45)
Y
Push REPEAT SW.
Was REPEAT lamp turned on?
N
[6-4] (See Page 46)
Y
Push FF, REV, NEXT PLAY SWs.
Are FF, REV, NEXT PLAY operations normal?
N
[4-1] (See Pages 35, 36 and 37)
Y
Push STOP SW.
Is unit returned to PAUSE mode with first program displayed? And then, is DISC motor stopped after 10 sec.?
N
[10-4]
(See Page 59)
Y
PLAY → Push EJECT SW.
Is door opened with DISC motor stopped?
N
[4-2] (See Page 38)
[10-4] (See Page 59)
Y
Operations are good.


Approx. 3 ~ 5
normal operati
Y
Was start limit SW pushed?
N
[6] J-8 ② (See Page 47)
[12] J-8 ② (See Page 66)
Y
EOK = L, FOK = H in [5] ?
N
[8-3] (See Page 51)
[3-3] (See Page 33)
Y
Is searching operation for 1st music normal?
N
[4-1] (See Pages 35, 36 and 37)
Y
Is display normal?
N
[6-1]
(See Page 45)
SEARCH
01
01
00:00
MANUAL
☐
PAUSE
Y
Push PLAY SW.
PLAY LED lights up.
Is beep sound heard?
N
[9-2] Buzzer circuit (See Page 53)
Y
Is sound (music) heard?; Is tonal quality normal?
N
[11-2] (See Pages 61 and 62)
Y
Is there sound skip?
Y
[3-2] (See Page 32)
N
Does time display advance?
N
[8-2] (See Page 50)
Y
Push PAUSE SW.
PAUSE LED lights up
Was sound muted?
N
[8-4] (See Page 51)
Was time display stopped?
N
[4-1] (See Pages 35, 36 and 37)
[8-2] (See Page 50)
Push PLAY SW.
TEN KEY → Push MEMORY SW.
Operations are good.

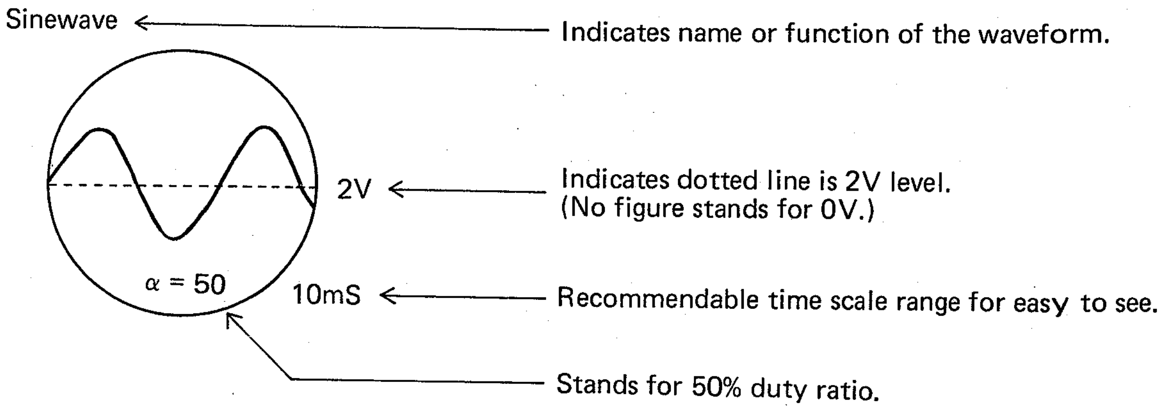

Approx. 3 ~ 5
normal operati
Y
Was start limit SW pushed?
N
[6] J-8 ② (See Page 47)
[12] J-8 ② (See Page 66)
Y
EOK = L, FOK = H in [5] ?
N
[8-3] (See Page 51)
[3-3] (See Page 33)
Y
Is searching operation for 1st music normal?
N
[4-1] (See Pages 35, 36 and 37)
Y
Is display normal?
N
[6-1]
(See Page 45)
SEARCH
01
01
00:00
MANUAL
PAUSE
Y
Push PLAY SW.
PLAY LED lights up.
Is beep sound heard?
N
[9-2] Buzzer circuit (See Page 53)
Y
Is sound (music) heard?; Is tonal quality normal?
N
[11-2] (See Pages 61 and 62)
Y
Is there sound skip?
Y
[3-2] (See Page 32)
N
Does time display advance?
N
[8-2] (See Page 50)
Y
Push PAUSE SW.
PAUSE LED lights up
Was sound muted?
N
[8-4] (See Page 51)
Was time display stopped?
N
[4-1] (See Pages 35, 36 and 37)
[8-2] (See Page 50)
Push PLAY SW.
TEN KEY → Push MEMORY SW.
Operations are good.

Circuits in the unit will be classified for convenience as follows:

[1]	DATA sampling, tracking servo (1)	Servo PCB
[2]	Focus servo, tracking coil drive circuit	Servo PCB
[3]	Tracking servo (2), dropout control circuit	Servo PCB
[4]	Kick circuit, eject circuit	Servo PCB
[5]	System control circuit (CPU1)	Servo PCB
[6]	System control circuit (CPU2), display circuit	Display PCB
[7]	Process circuit (1)	Process PCB (Buzzer & Feed motor circuits on servo PCB)
[8]	Process circuit (2), system clock circuit	
[9]	PLL circuit, buzzer circuit, feed motor circuit	
[10]	Constant Liner Velocity (CLV) circuit	
[11]	Digital/Analogue Converter (D/AC)	
[12]	Mechanism control circuit	Mecha. PCB
[13]	Power circuit	Power PCB
[14]	Others (Adjustment, encoder, replacement of Pick-Up)	
[15]	Failures relating to mechanism	
[16]	Measurement equipment data, alignment jig data	

A wave-form in a circule shown on a schematic diagram denotes a waveform observed with an oscilloscope, etc.

Example:



Indicates name or function of the waveform.

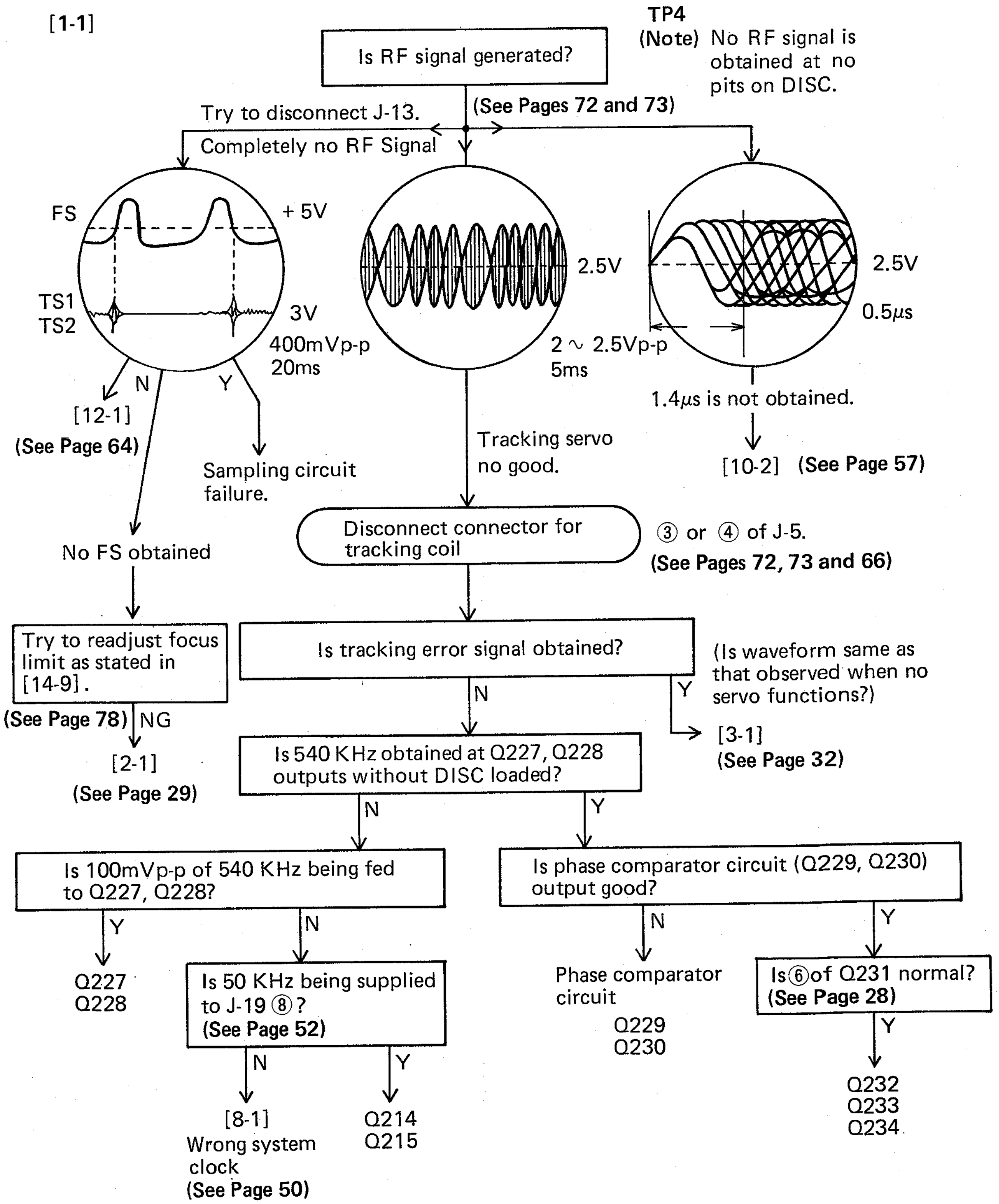
Indicates dotted line is 2V level.
(No figure stands for 0V.)

Recommendable time scale range for easy to see.

Stands for 50% duty ratio.

[1] DATA SAMPLING, TRACKING SERVO (1)

[1-1]

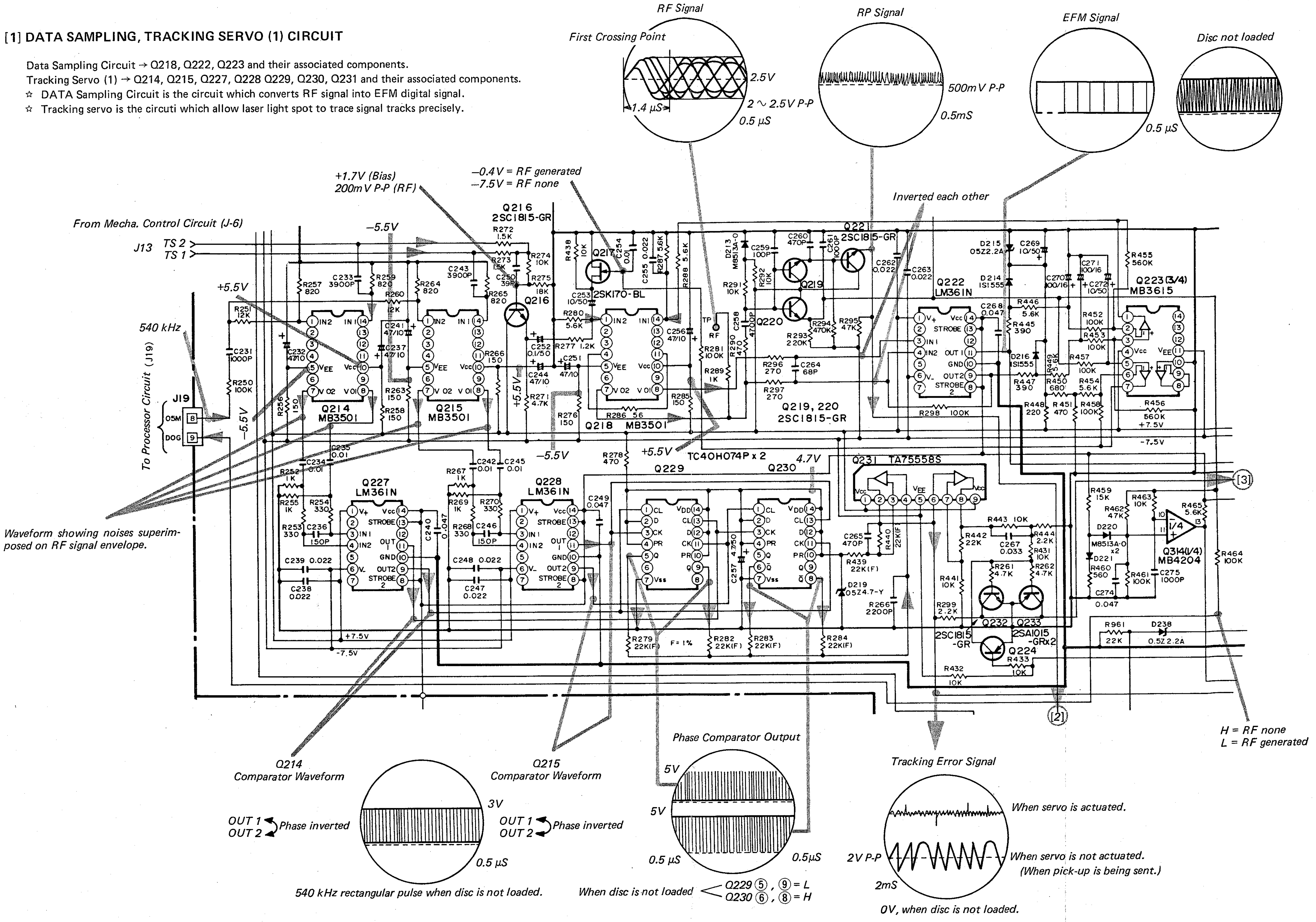

Is RF signal generated?
TP4
(Note) No RF signal is obtained at no pits on DISC.
(See Pages 72 and 73)
Try to disconnect J-13.
Completely no RF Signal
FS
+5V
TS1
TS2
3V
400mVp-p
20ms
N
Y
[12-1]
(See Page 64)
Sampling circuit failure.
No FS obtained
Try to readjust focus limit as stated in [14-9].
(See Page 78)
NG
[2-1]
(See Page 29)
2.5V
2 ∿ 2.5Vp-p
5ms
Tracking servo no good.
2.5V
0.5μs
1.4μs is not obtained.
[10-2] (See Page 57)
Disconnect connector for tracking coil
③ or ④ of J-5.
(See Pages 72, 73 and 66)
Is tracking error signal obtained?
(Is waveform same as that observed when no servo functions?)
N
Y
[3-1]
(See Page 32)
Is 540 KHz obtained at Q227, Q228 outputs without DISC loaded?
N
Y
Is 100mVp-p of 540 KHz being fed to Q227, Q228?
Y
N
Q227
Q228
Is 50 KHz being supplied to J-19 ⑧?
(See Page 52)
N
Y
[8-1]
Wrong system clock
(See Page 50)
Q214
Q215
Is phase comparator circuit (Q229, Q230) output good?
N
Y
Phase comparator circuit
Q229
Q230
Is ⑥ of Q231 normal?
(See Page 28)
Y
Q232
Q233
Q234

Note)
- Tracking error signal is not generated until laser light is output and [Pick-up] is sent with the feed motor.
- Focus search operation is not started until the door is closed and [Pick-up] makes start limit switch turn on.

[1] DATA SAMPLING, TRACKING SERVO (1) CIRCUIT

Data Sampling Circuit → Q218, Q222, Q223 and their associated components.
Tracking Servo (1) → Q214, Q215, Q227, Q228 Q229, Q230, Q231 and their associated components.

☆ DATA Sampling Circuit is the circuit which converts RF signal into EFM digital signal.
☆ Tracking servo is the circuti which allow laser light spot to trace signal tracks precisely.



RF Signal
First Crossing Point
2.5V
2 ∿ 2.5V P-P
1.4 µS
0.5 µS

RP Signal
500mV P-P
0.5mS

EFM Signal
0.5 µS

Disc not loaded

Inverted each other

+1.7V (Bias)
200mV P-P (RF)

–0.4V = RF generated
–7.5V = RF none

From Mecha. Control Circuit (J-6)

540 kHz

To Processor Circuit (J19)

Waveform showing noises superimposed on RF signal envelope.

H = RF none
L = RF generated

Q214
Comparator Waveform
OUT 1
OUT 2 *Phase inverted*
3V
0.5 µS
540 kHz rectangular pulse when disc is not loaded.

Q215
Comparator Waveform
OUT 1
OUT 2 *Phase inverted*

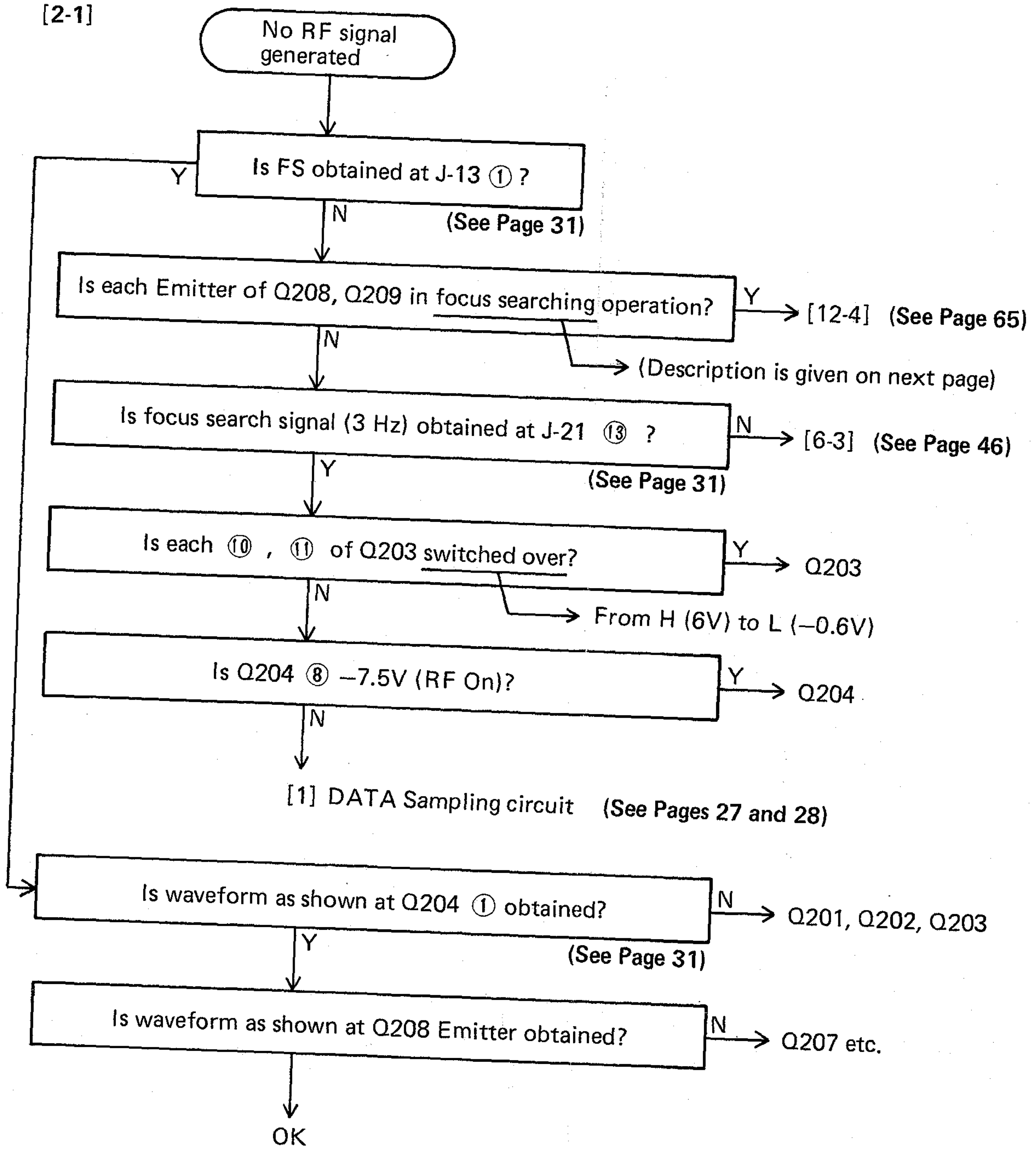
Phase Comparator Output
5V
5V
0.5 µS
0.5µS
When disc is not loaded < *Q229 ⑤, ⑨ = L*
Q230 ⑥, ⑧ = H

Tracking Error Signal
When servo is actuated.
2V P-P
When servo is not actuated.
(When pick-up is being sent.)
2mS
0V, when disc is not loaded.

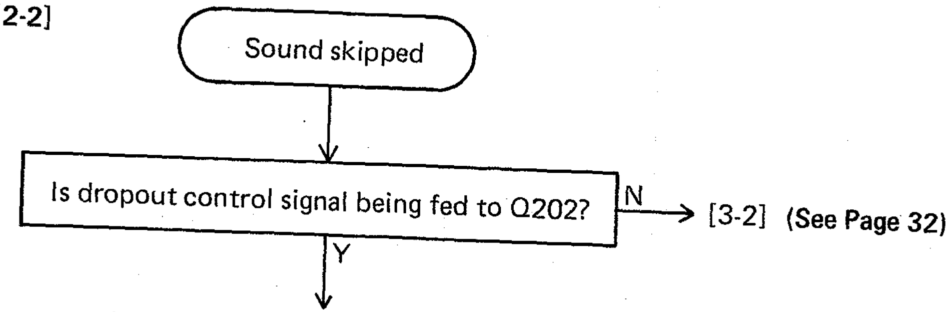
J13
TS 2
TS 1
J19
O5M
DOG
+5.5V
–5.5V
+5.5V
–5.5V
4.7V
+7.5V
–7.5V
Q214 MB3501
Q215 MB3501
Q216 2SC1815-GR
Q217 2SK170-BL
Q218 MB3501
Q219, 220 2SC1815-GR
Q221 2SC1815-GR
Q222 LM361N
Q223 (3/4) MB3615
Q227 LM361N
Q228 LM361N
Q229
Q230
TC40H074P x 2
Q231 TA75558S
Q232 Q233
2SC1815-GR
2SA1015-GR x2
Q224
Q314 (1/4) MB4204
D213 MB513A-0
D215 05Z2.2A
D214 IS1555
D216 IS1555
D219 05Z4.7-Y
D220 MB513A-O x2
D221
D238 0.5Z 2.2A
TP RF
R257 820
C233 3900P
R259 820
R260 12K
R264 820
C243 3900P
R272 1.5K
R273 1.5K
R274 10K
R275 18K
C250 39P
R265 820
R438 10K
C254 0.01
C255 0.022
R287 5.6K
R288 5.6K
C253 10/50
R280 5.6K
C252 0.1/50
R277 1.2K
C251 47/10
C244 47/10
R271 4.7K
R276 150
C256 47/10
R281 10 OK
R289 1K
R290 470
C258 470P
R291 10K
R292 10K
C259 100P
C260 470P
C261 100P
C262 0.022
C263 0.022
R293 220K
R294 470K
R295 47K
R296 270
C264 68P
R297 270
R286 56
R285 150
R251 12K
C231 1000P
C232 47/10
R250 100K
R256 150
C241 47/10
C237 47/10
R266 150
R263 150
R258 150
C269 10/50
C271 100/16
C270 100/16
C272 10/50
R455 560K
C268 0.047
R446 5.6K
R445 390
R452 100K
R453 100K
R457 100K
R449 5.6K
R447 390
R450 680
R454 5.6K
R448 220
R451 470
R458 100K
R298 100K
R456 560K
C235 0.01
C234 0.01
R252 1K
R255 1K
R254 330
R253 330
C236 150P
C239 0.022
C238 0.022
R267 1K
C242 0.01
C245 0.01
R269 1K
R270 330
R268 330
C246 150P
C248 0.022
C247 0.022
C240 0.047
C249 0.047
R278 470
C257 4.7/50
R279 22K(F)
F = 1%
R282 22K(F)
R283 22K(F)
R284 22K(F)
C265 470P
R440 22K(F)
R439 22K(F)
R266 2200P
R443 10K
R442 22K
C267 0.033
R444 2.2K
R431 10K
R261 4.7K
R262 4.7K
R441 10K
R299 2.2K
R433 10K
R432 10K
R459 15K
R462 47K
R463 10K
R465 5.6K
R460 560
R461 100K
C275 1000P
C274 0.047
R464 100K
R961 22K
[2]
[3]

[2] FOCUS SERVO, TRACKING COIL DRIVE CIRCUIT

[2-1]


No RF signal generated
Is FS obtained at J-13 ① ?
Y
N
(See Page 31)
Is each Emitter of Q208, Q209 in focus searching operation?
Y
[12-4] (See Page 65)
N
(Description is given on next page)
Is focus search signal (3 Hz) obtained at J-21 ⑬ ?
N
[6-3] (See Page 46)
Y
(See Page 31)
Is each ⑩ , ⑪ of Q203 switched over?
Y
Q203
N
From H (6V) to L (−0.6V)
Is Q204 ⑧ −7.5V (RF On)?
Y
Q204
N
[1] DATA Sampling circuit (See Pages 27 and 28)
Is waveform as shown at Q204 ① obtained?
N
Q201, Q202, Q203
Y
(See Page 31)
Is waveform as shown at Q208 Emitter obtained?
N
Q207 etc.
OK

[2-2]


Sound skipped
Is dropout control signal being fed to Q202?
N
[3-2] (See Page 32)
Y

Focus tracking coil drive voltage waveform (depending upon dropout control signals) should be the same as that shown in the schematic diagram. If not, Q202 may be suspected.

[2-3] Tracking Coil Drive Circuit

The tracking coil will move, when waveform is obtained at each emitter of Q210 and Q211.

What is Focus Search?

Focus search is to move a focus coil back and forth to focus the later beam on a signal pit on a disc. In practice, 3 Hz pulse trains from the microcomputer (CPU2) are processed in the Focus Servo Circuit and transmitted to the focus coils. After the focus has been achieved once, C-MOS switch (TC-4053BP) is switched in to actuate the focus servo so that the focus is always maintained.

How to Check Focus Searching Operations?

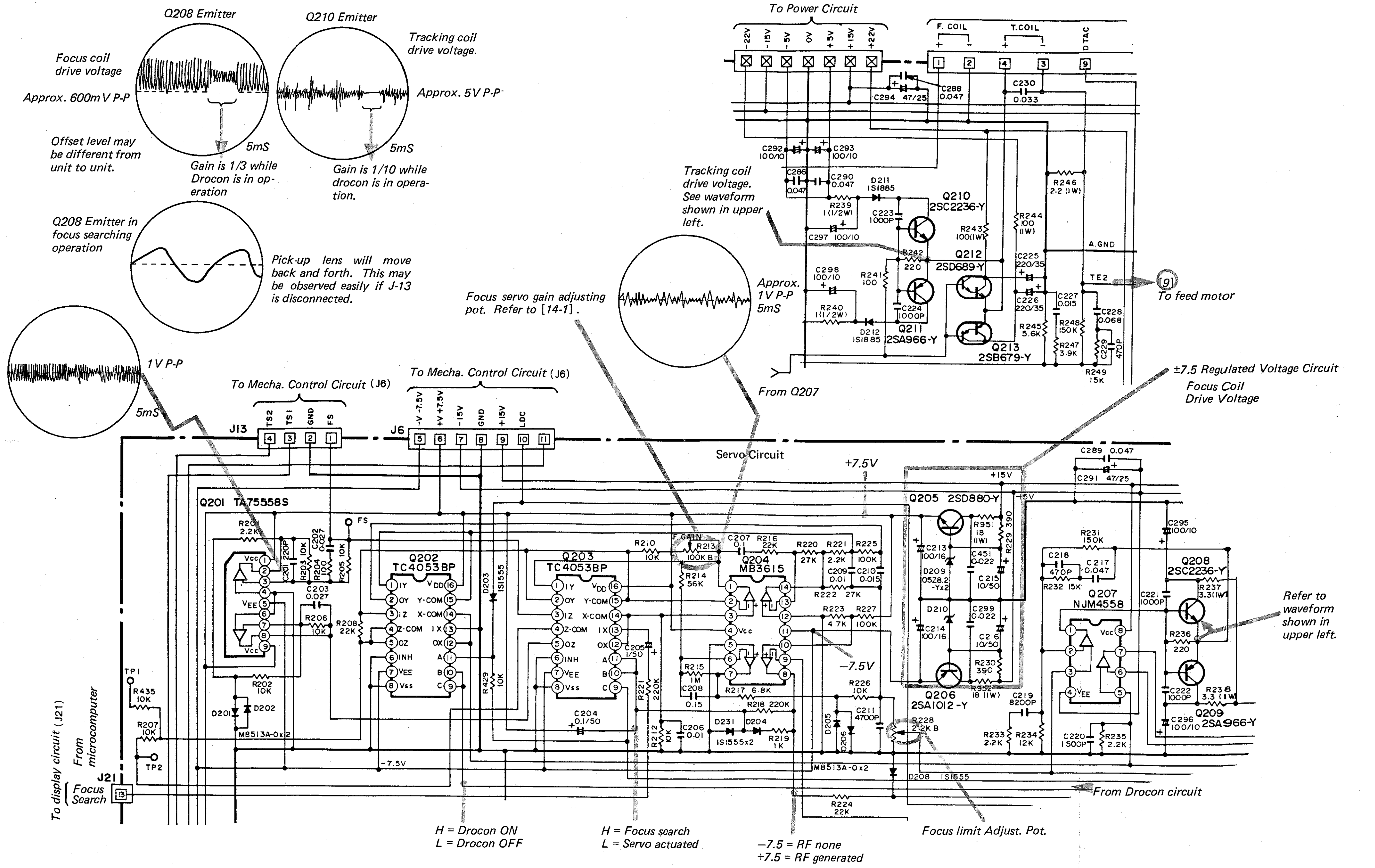
To check whether the focus search is carried out correctly, load a disc with J-13 on servo PCB disconnected, and observe a waveform at either emitter of Q208 or Q209, approx. 1Vp-p of 3 Hz, which looks like a sinewave, should be obtained and the pickup lens should be moved back and forth.

[2] FOCUS SERVO, TRACKING COIL DRIVE CIRCUIT

☆ Focus servo is the circuit which controls laser light to focus on disc pits.

What is "Drocon"

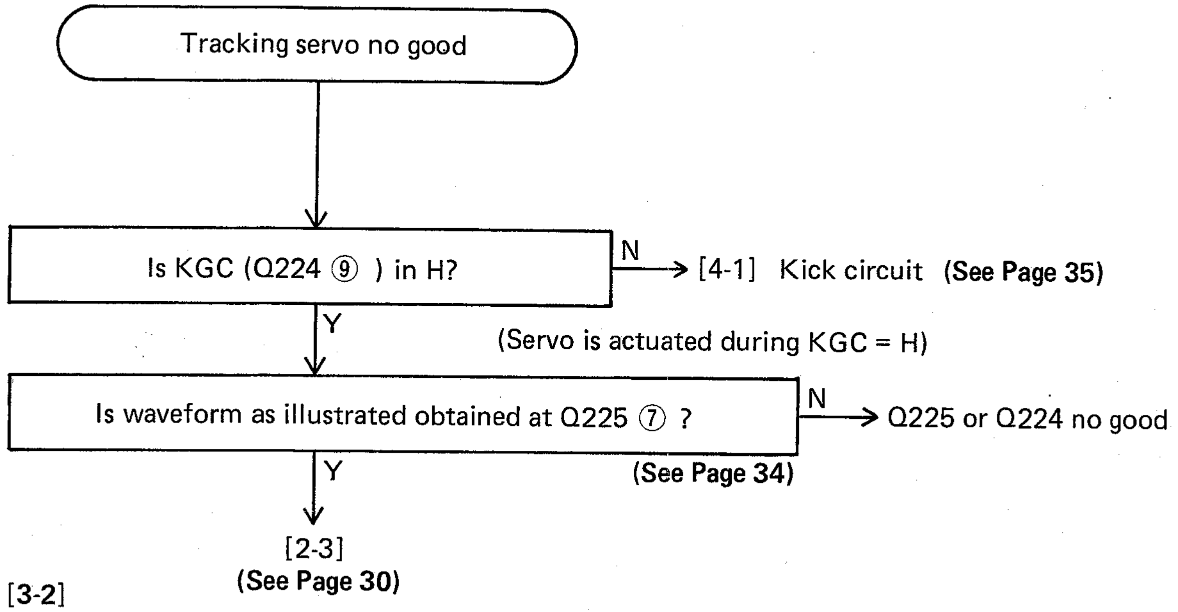
"Drocon" stands for "drop out control" which functions to eliminate sound skips caused by scratches or dusts attached on a disc surface by reducing servo gain.



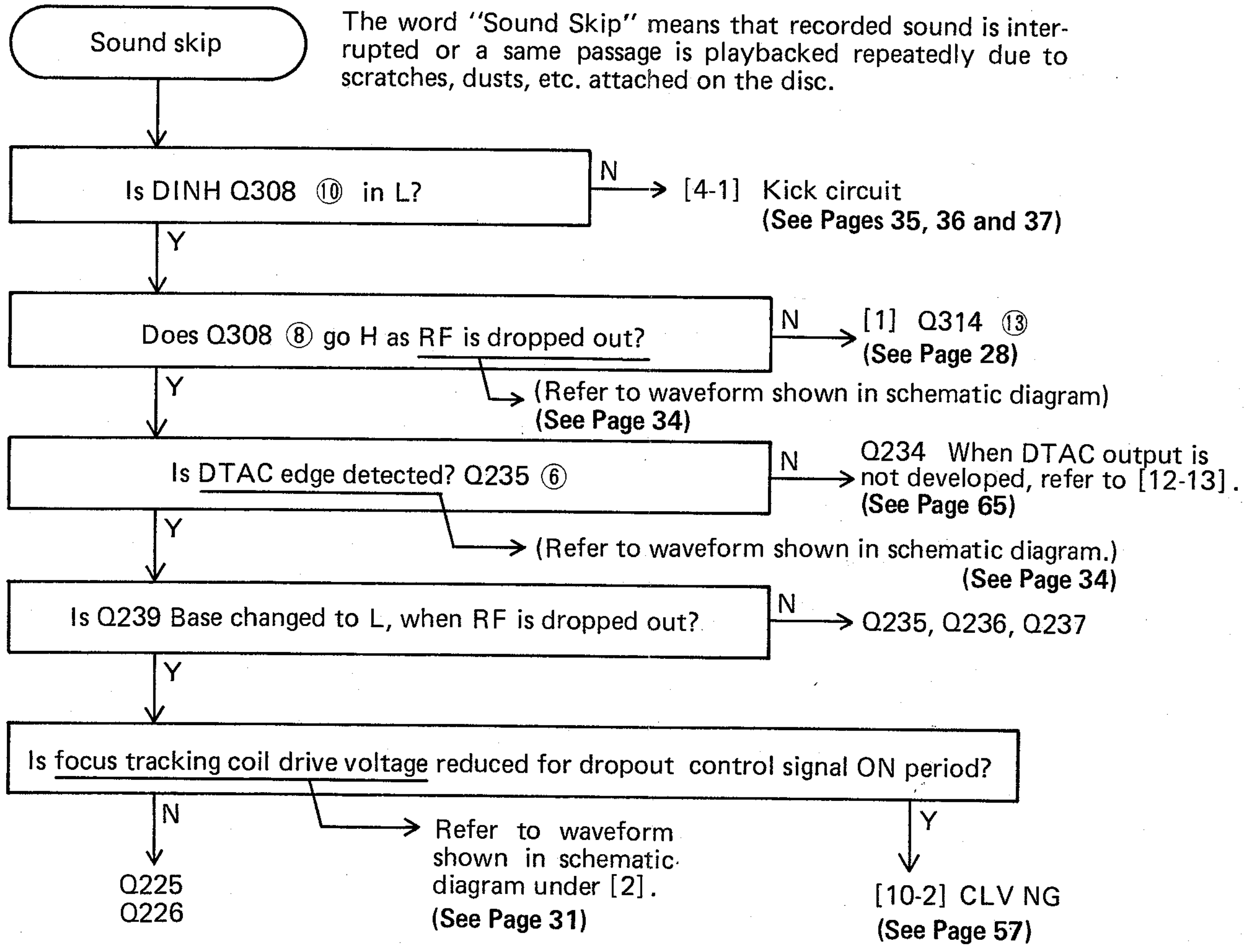
Q208 Emitter
Q210 Emitter
Focus coil drive voltage
Approx. 600mV P-P
Tracking coil drive voltage.
Approx. 5V P-P
Offset level may be different from unit to unit.
5mS
Gain is 1/3 while Drocon is in operation
5mS
Gain is 1/10 while drocon is in operation.
Q208 Emitter in focus searching operation
Pick-up lens will move back and forth. This may be observed easily if J-13 is disconnected.
1V P-P
5mS
Focus servo gain adjusting pot. Refer to [14-1].
To Power Circuit
-22V
-15V
-5V
0V
+5V
+15V
+22V
F. COIL
T.COIL
DTAC
C294 47/25
C288 0.047
C230 0.033
Tracking coil drive voltage. See waveform shown in upper left.
C292 100/10
C293 100/10
C286 0.047
C290 0.047
D211 1S1885
R239 1(1/2W)
C223 1000P
C297 100/10
Q210 2SC2236-Y
R243 100(1W)
R244 100 (1W)
R246 2.2 (1W)
Approx. 1V P-P 5mS
C298 100/10
R241 100
R242 220
Q212 2SD689-Y
C225 220/35
A.GND
TE2
9
To feed motor
R240 1(1/2W)
D212 1S1885
C224 1000P
Q211 2SA966-Y
C226 220/35
C227 0.015
C228 0.068
R245 5.6K
R248 150K
R247 3.9K
C229 470P
Q213 2SB679-Y
R249 15K
From Q207
±7.5 Regulated Voltage Circuit
Focus Coil Drive Voltage
To Mecha. Control Circuit (J6)
To Mecha. Control Circuit (J6)
TS2
TS1
GND
FS
J13
J6
-V -7.5V
+V +7.5V
-15V
GND
+15V
LDC
Servo Circuit
+7.5V
Q201 TA75558S
R201 2.2K
C201 220P
R203 10K
R204 100
C202 0.027
R205 10K
C203 0.027
R206 10K
R208 22K
FS
Q202 TC4053BP
Q203 TC4053BP
1Y VDD
0Y Y-COM
1Z X-COM
Z-COM 1X
0Z 0X
INH A
VEE B
Vss C
D203 1S1555
R429 10K
R210 10K
F.GAIN
R213 100K B
R214 56K
C207 0.1
R216 22K
Q204 MB3615
R220 27K
R221 2.2K
R225 100K
C209 0.01
C210 0.015
R222 27K
R223 4.7K
R227 100K
C205 1/50
C204 0.1/50
R215 1M
C208 0.15
R217 6.8K
R218 220K
R221 220K
R212 10K
C206 0.01
D231
D204
1S1555x2
R219 1K
-7.5V
R226 10K
C211 4700P
D205
D206
R228 2.2K B
M8513A-0x2
D208 1S1555
R224 22K
TP1
R435 10K
R202 10K
D201
D202
M8513A-0x2
R207 10K
TP2
-7.5V
J21
To display circuit (J21)
From microcomputer
Focus Search
Q205 2SD880-Y
+15V
-15V
R951 18 (1W)
R229 390
C213 100/16
C451 0.022
D209 05Z8.2-Yx2
C215 10/50
D210
C299 0.022
C214 100/16
C216 10/50
R230 390
R952 18 (1W)
Q206 2SA1012-Y
C289 0.047
C291 47/25
R231 150K
C218 470P
C217 0.047
R232 15K
Q207 NJM4558
C295 100/10
Q208 2SC2236-Y
R237 3.3(1W)
C221 1000P
R236 220
C219 8200P
R233 2.2K
R234 12K
C220 1500P
R235 2.2K
C222 1000P
R238 3.3 (1W)
C296 100/10
Q209 2SA966-Y
Refer to waveform shown in upper left.
From Drocon circuit
H = Drocon ON
L = Drocon OFF
H = Focus search
L = Servo actuated
-7.5 = RF none
+7.5 = RF generated
Focus limit Adjust. Pot.

[3] TRACKING SERVO (2) DROPOUT CONTROL CIRCUIT

[3-1]

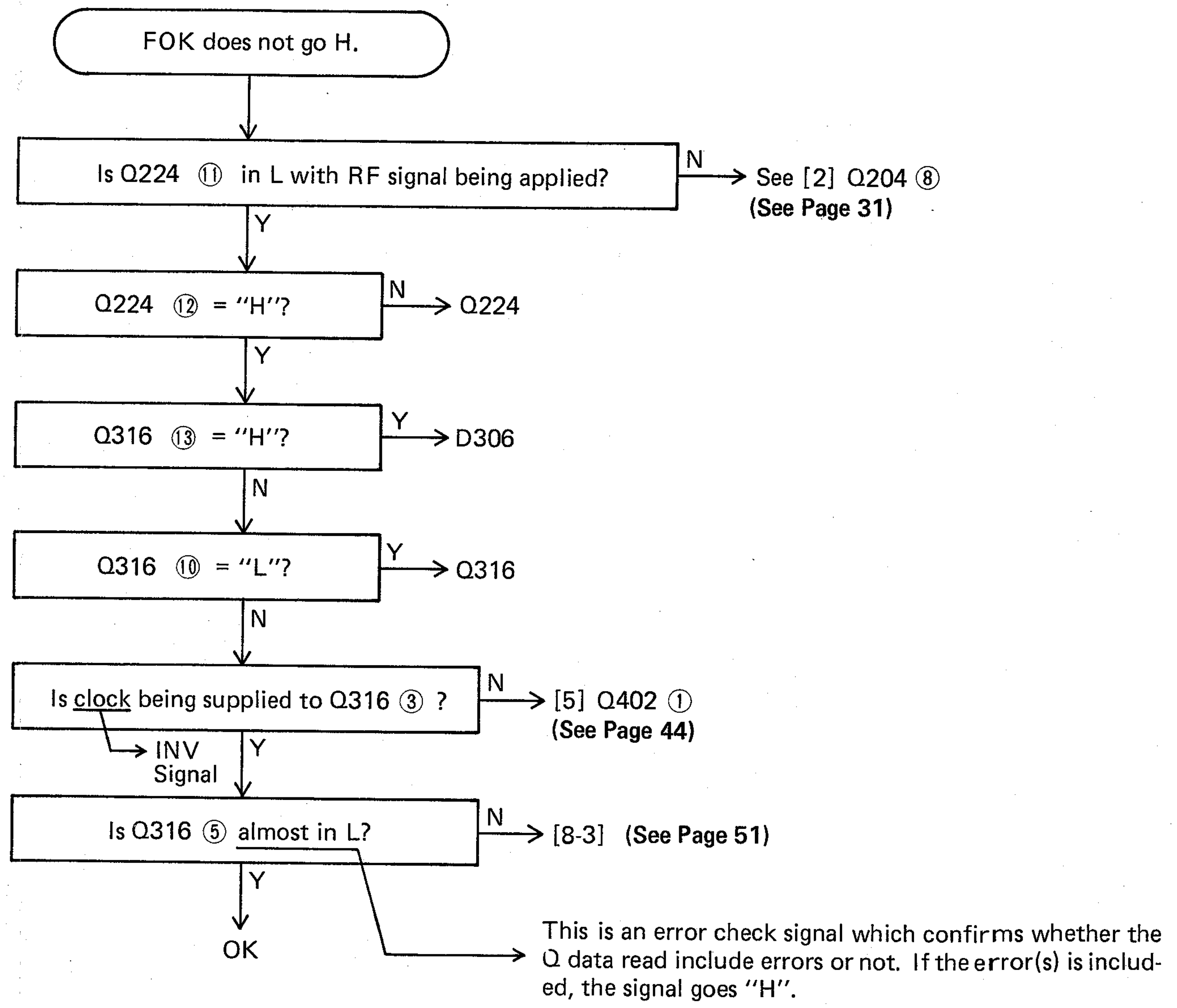

Tracking servo no good
Is KGC (Q224 ⑨) in H?
N
[4-1] Kick circuit (See Page 35)
Y
(Servo is actuated during KGC = H)
Is waveform as illustrated obtained at Q225 ⑦ ?
N
Q225 or Q224 no good
Y
(See Page 34)
[2-3]
(See Page 30)

[3-2]


Sound skip
Is DINH Q308 ⑩ in L?
N
[4-1] Kick circuit
(See Pages 35, 36 and 37)
Y
Does Q308 ⑧ go H as RF is dropped out?
N
[1] Q314 ⑬
(See Page 28)
Y
(Refer to waveform shown in schematic diagram)
(See Page 34)
Is DTAC edge detected? Q235 ⑥
N
Q234 When DTAC output is not developed, refer to [12-13].
(See Page 65)
Y
(Refer to waveform shown in schematic diagram.)
(See Page 34)
Is Q239 Base changed to L, when RF is dropped out?
N
Q235, Q236, Q237
Y
Is focus tracking coil drive voltage reduced for dropout control signal ON period?
N
Q225
Q226
Refer to waveform shown in schematic diagram under [2].
(See Page 31)
Y
[10-2] CLV NG
(See Page 57)

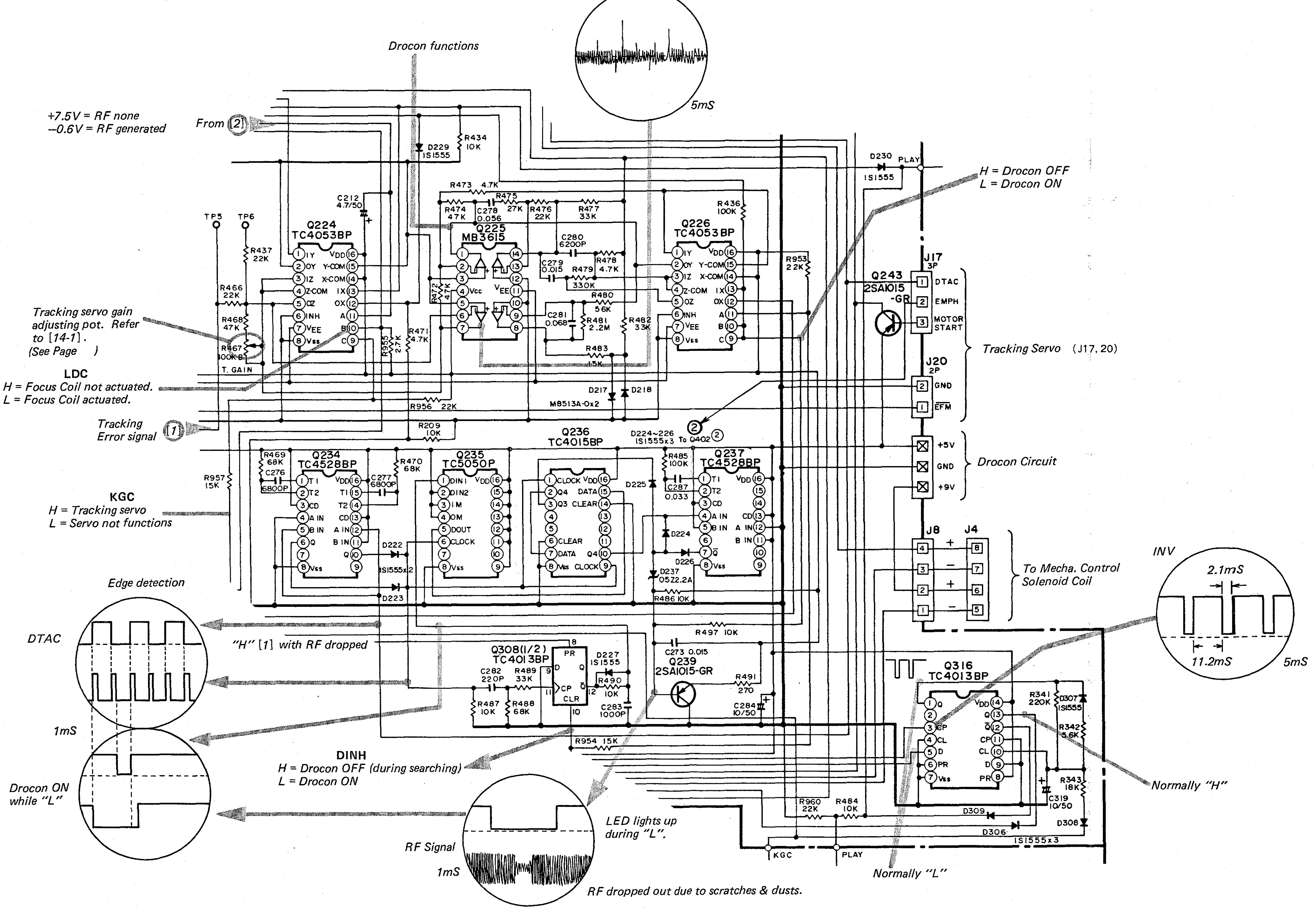
The word "Sound Skip" means that recorded sound is interrupted or a same passage is playbacked repeatedly due to scratches, dusts, etc. attached on the disc.

[3-3]


FOK does not go H.
Is Q224 ⑪ in L with RF signal being applied?
N
See [2] Q204 ⑧
(See Page 31)
Y
Q224 ⑫ = "H"?
N
Q224
Y
Q316 ⑬ = "H"?
Y
D306
N
Q316 ⑩ = "L"?
Y
Q316
N
Is clock being supplied to Q316 ③ ?
N
[5] Q402 ①
(See Page 44)
INV
Signal
Y
Is Q316 ⑤ almost in L?
N
[8-3] (See Page 51)
Y
OK
This is an error check signal which confirms whether the Q data read include errors or not. If the error(s) is included, the signal goes "H".

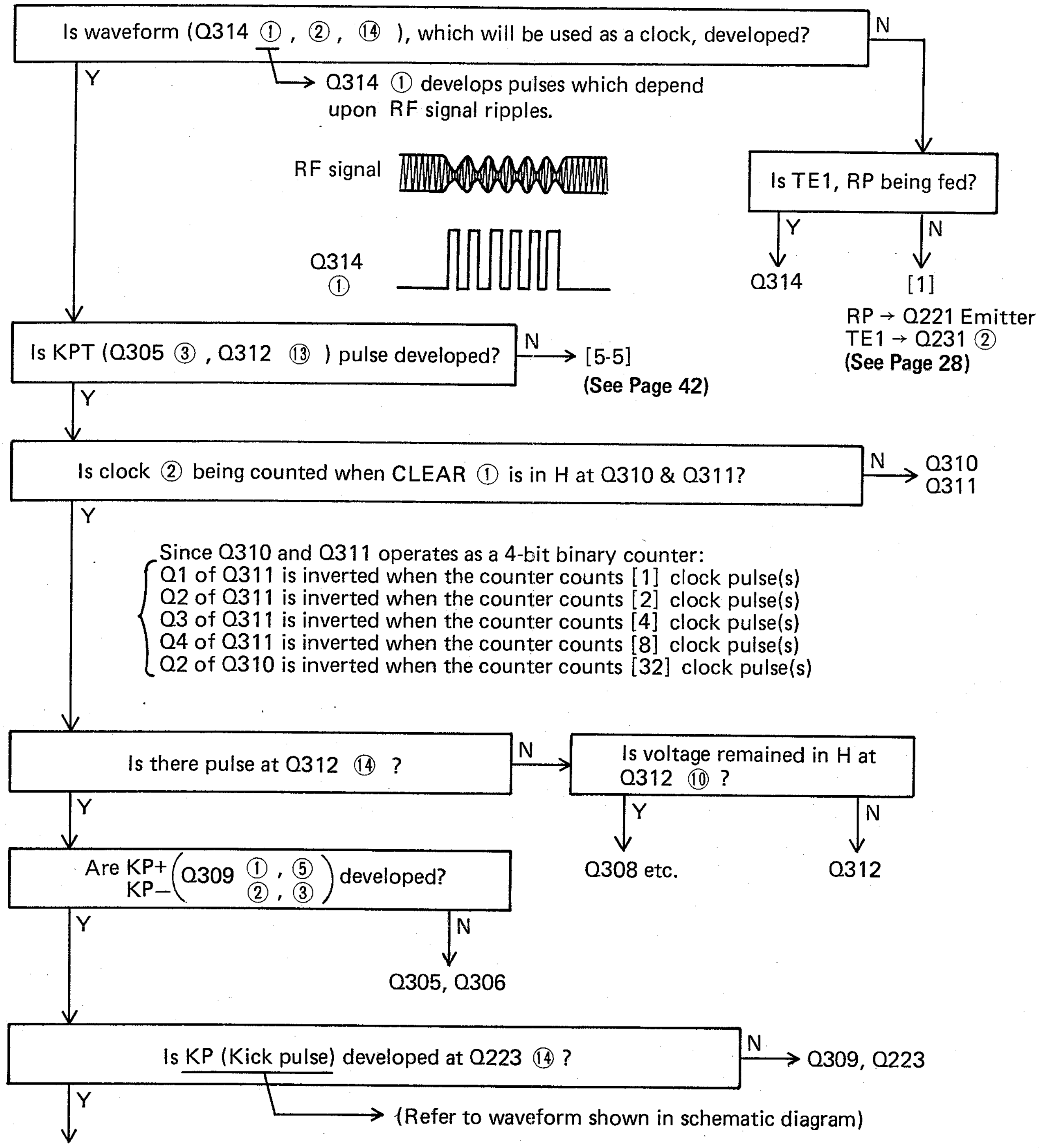
Note: It is recommendable to check that the servo gain adjustment pot has been set properly when checking Focus Servo & Tracking Servo circuits.

[3] TRACKING SERVO (2) DROPOUT CONTROL CIRCUIT


Tracking servo waveform
5mS
Drocon functions
+7.5V = RF none
–0.6V = RF generated
From (2)
D229 1S1555
R434 10K
C212 4.7/50
TP5
TP6
R437 22K
Q224 TC4053BP
R466 22K
R468 47K
R467 100K-B
T. GAIN
R471 4.7K
R955 2.7K
R473 4.7K
R475 27K
R474 47K
C278 0.056
R476 22K
R477 33K
Q225 MB3615
R472 47K
C280 6200P
C279 0.015
R479 330K
R478 4.7K
R480 56K
C281 0.068
R481 2.2M
R482 33K
R483 1.5K
D217 D218 MB513A-0x2
Q226 TC4053BP
R436 100K
R953 22K
D230 PLAY
1S1555
H = Drocon OFF
L = Drocon ON
Q243 2SA1015-GR
J17 3P
DTAC
EMPH
MOTOR START
J20 2P
GND
EFM
Tracking Servo (J17, 20)
+5V
GND
+9V
Drocon Circuit
Tracking servo gain adjusting pot. Refer to [14-1]. (See Page)
LDC
H = Focus Coil not actuated.
L = Focus Coil actuated.
R956 22K
Tracking Error signal (1)
R209 10K
Q236 TC4015BP
D224~226 1S1555x3 To Q402 (2)
R957 15K
KGC
H = Tracking servo
L = Servo not functions
R469 68K
C276 6800P
Q234 TC4528BP
C277 6800P
R470 68K
Q235 TC5050P
D222
1S1555x2
D223
R485 100K
C287 0.033
D225
Q237 TC4528BP
D224
D226
D237 05Z2.2A
R486 10K
J8 J4
To Mecha. Control Solenoid Coil
Edge detection
DTAC
1mS
Drocon ON while "L"
"H" [1] with RF dropped
Q308(1/2) TC4013BP
C282 220P
R489 33K
R487 10K
R488 68K
D227 1S1555
R490 10K
C283 1000P
R497 10K
C273 0.015
Q239 2SA1015-GR
R491 270
C284 10/50
R954 15K
DINH
H = Drocon OFF (during searching)
L = Drocon ON
LED lights up during "L".
RF Signal
1mS
RF dropped out due to scratches & dusts.
R960 22K
R484 10K
KGC
PLAY
Normally "L"
Q316 TC4013BP
R341 220K
D307 1S1555
R342 5.6K
R343 18K
C319 10/50
D309
D306
D308
1S1555x3
Normally "H"
INV
2.1mS
11.2mS
5mS

[4] KICK CIRCUIT, EJECT CIRCUIT

[4-1]



Is waveform (Q314 ①, ②, ⑭), which will be used as a clock, developed?

- Y → Q314 ① develops pulses which depend upon RF signal ripples.
- N → Is TE1, RP being fed?
  - Y → Q314
  - N → [1] RP → Q221 Emitter, TE1 → Q231 ② **(See Page 28)**

RF signal
Q314
①

Is KPT (Q305 ③, Q312 ⑬) pulse developed?

- N → [5-5] **(See Page 42)**

Is clock ② being counted when CLEAR ① is in H at Q310 & Q311?

- N → Q310 Q311

Since Q310 and Q311 operates as a 4-bit binary counter:

- Q1 of Q311 is inverted when the counter counts [1] clock pulse(s)
- Q2 of Q311 is inverted when the counter counts [2] clock pulse(s)
- Q3 of Q311 is inverted when the counter counts [4] clock pulse(s)
- Q4 of Q311 is inverted when the counter counts [8] clock pulse(s)
- Q2 of Q310 is inverted when the counter counts [32] clock pulse(s)

Is there pulse at Q312 ⑭?

- N → Is voltage remained in H at Q312 ⑩?
  - Y → Q308 etc.
  - N → Q312

Are KP+ KP− (Q309 ①, ⑤ / ②, ③) developed?

- N → Q305, Q306

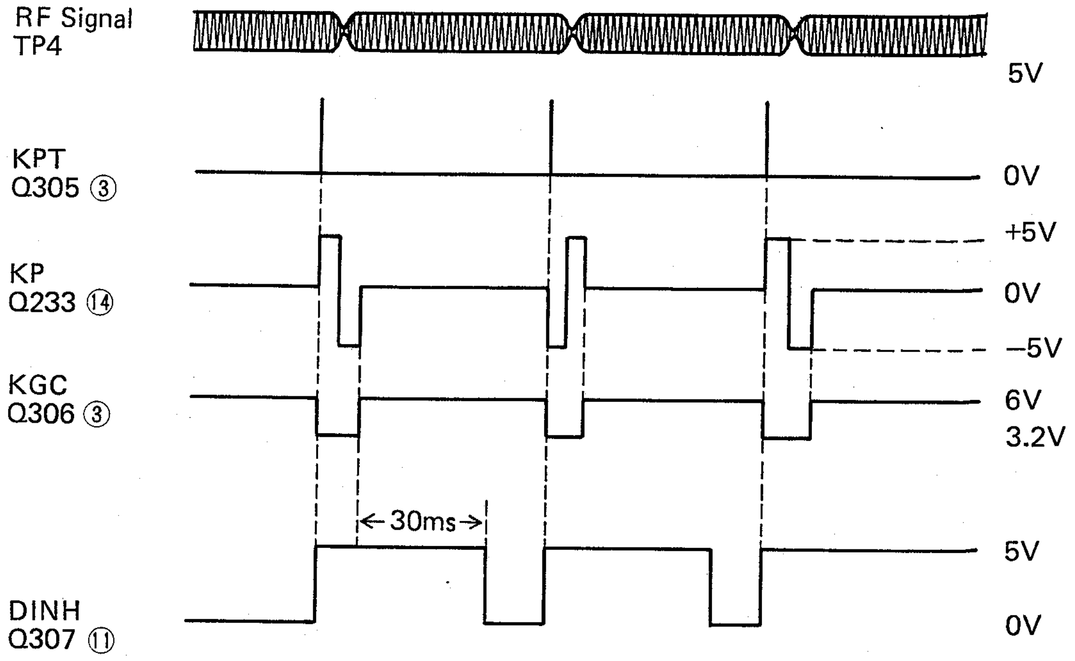
Is KP (Kick pulse) developed at Q223 ⑭?

- N → Q309, Q223
- KP → (Refer to waveform shown in schematic diagram)

[2] Tracking coil is moved when KP is input to tracking coil drive circuit.

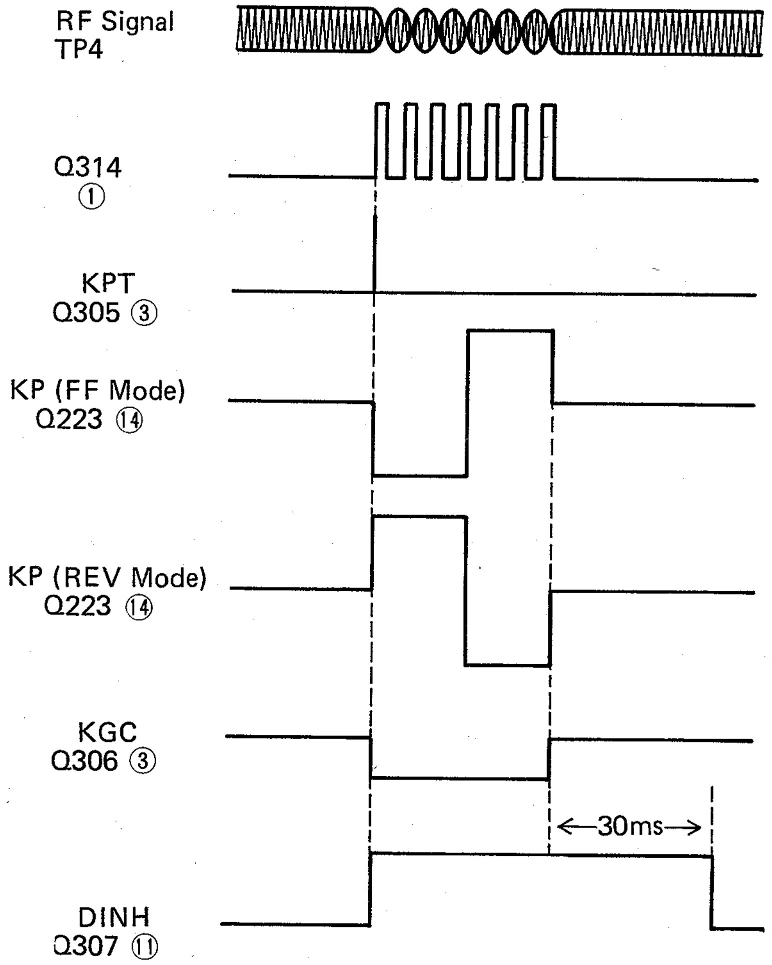
Kick Circuit Waveforms in Normal-Operation

- Pause Mode



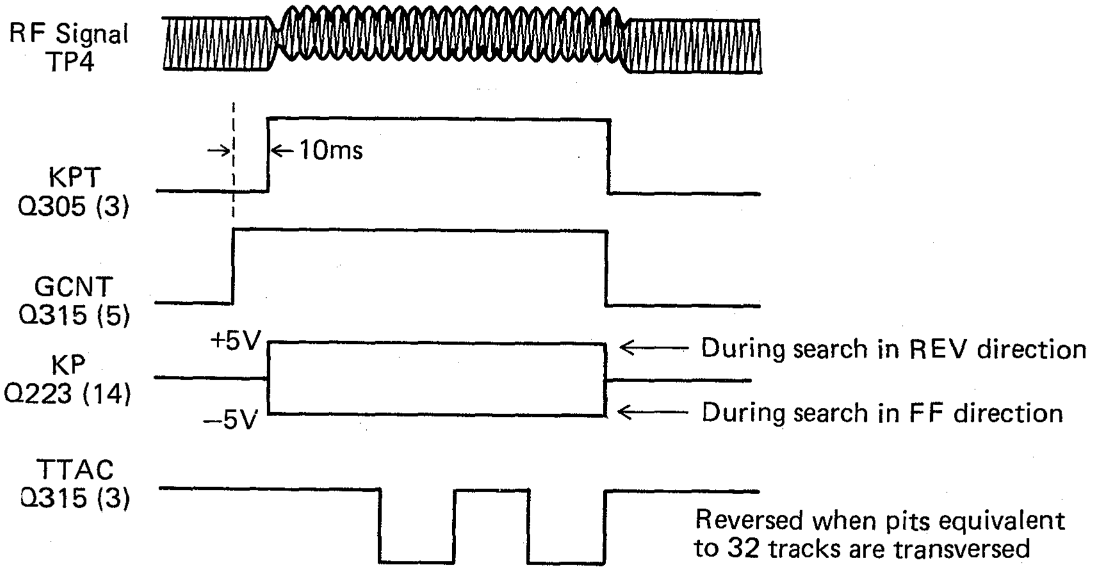
RF Signal
TP4
KPT
Q305 ③
KP
Q233 ⑭
KGC
Q306 ③
DINH
Q307 ⑪
5V
0V
+5V
0V
−5V
6V
3.2V
30ms
5V
0V

- FF/REV Mode

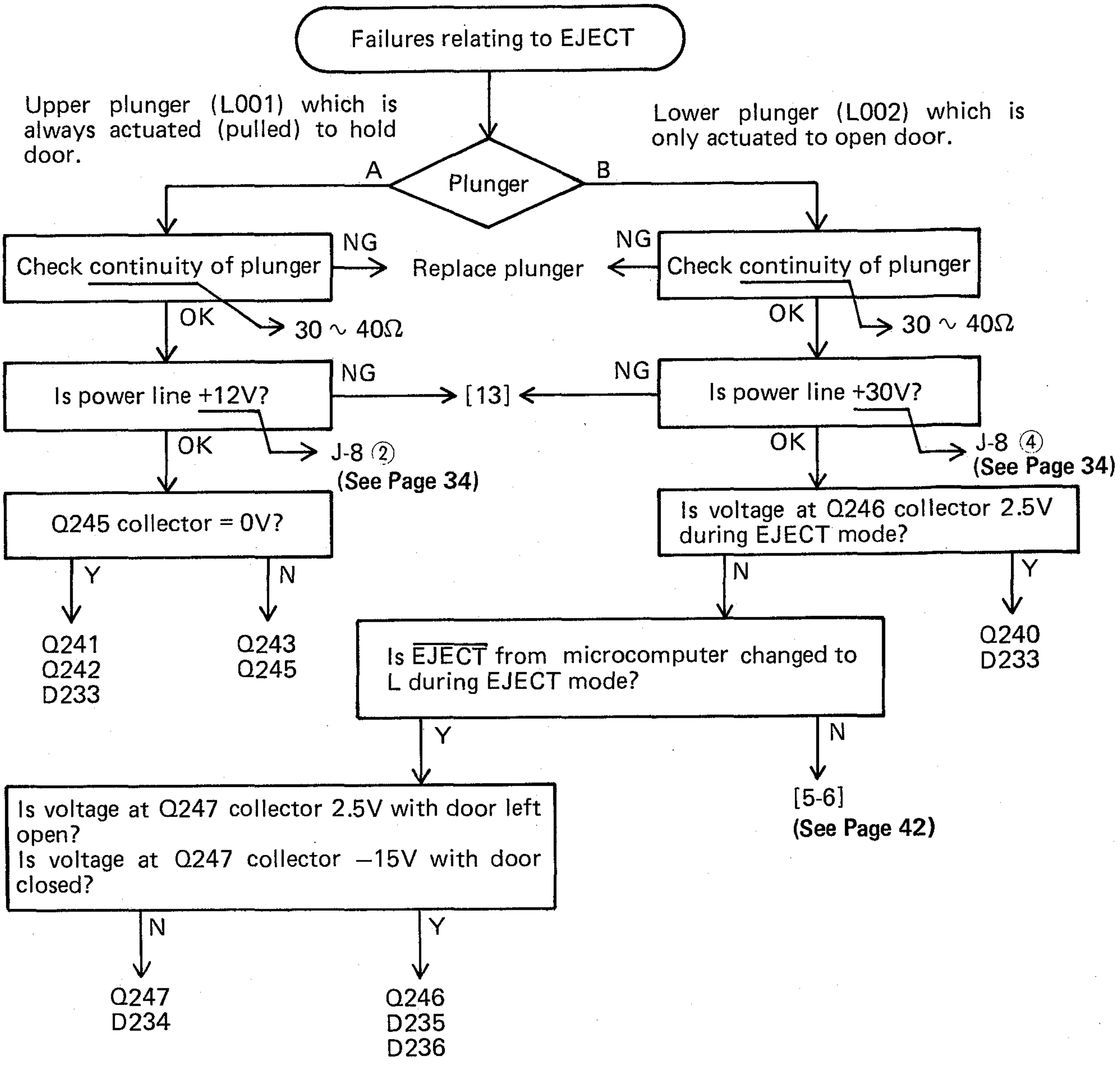


RF Signal
TP4
Q314
①
KPT
Q305 ③
KP (FF Mode)
Q223 ⑭
KP (REV Mode)
Q223 ⑭
KGC
Q306 ③
DINH
Q307 ⑪
30ms

- Long Distance Search Mode


RF Signal
TP4
10ms
KPT
Q305 (3)
GCNT
Q315 (5)
+5V
KP
Q223 (14)
–5V
During search in REV direction
During search in FF direction
TTAC
Q315 (3)
Reversed when pits equivalent to 32 tracks are transversed

[4-2]

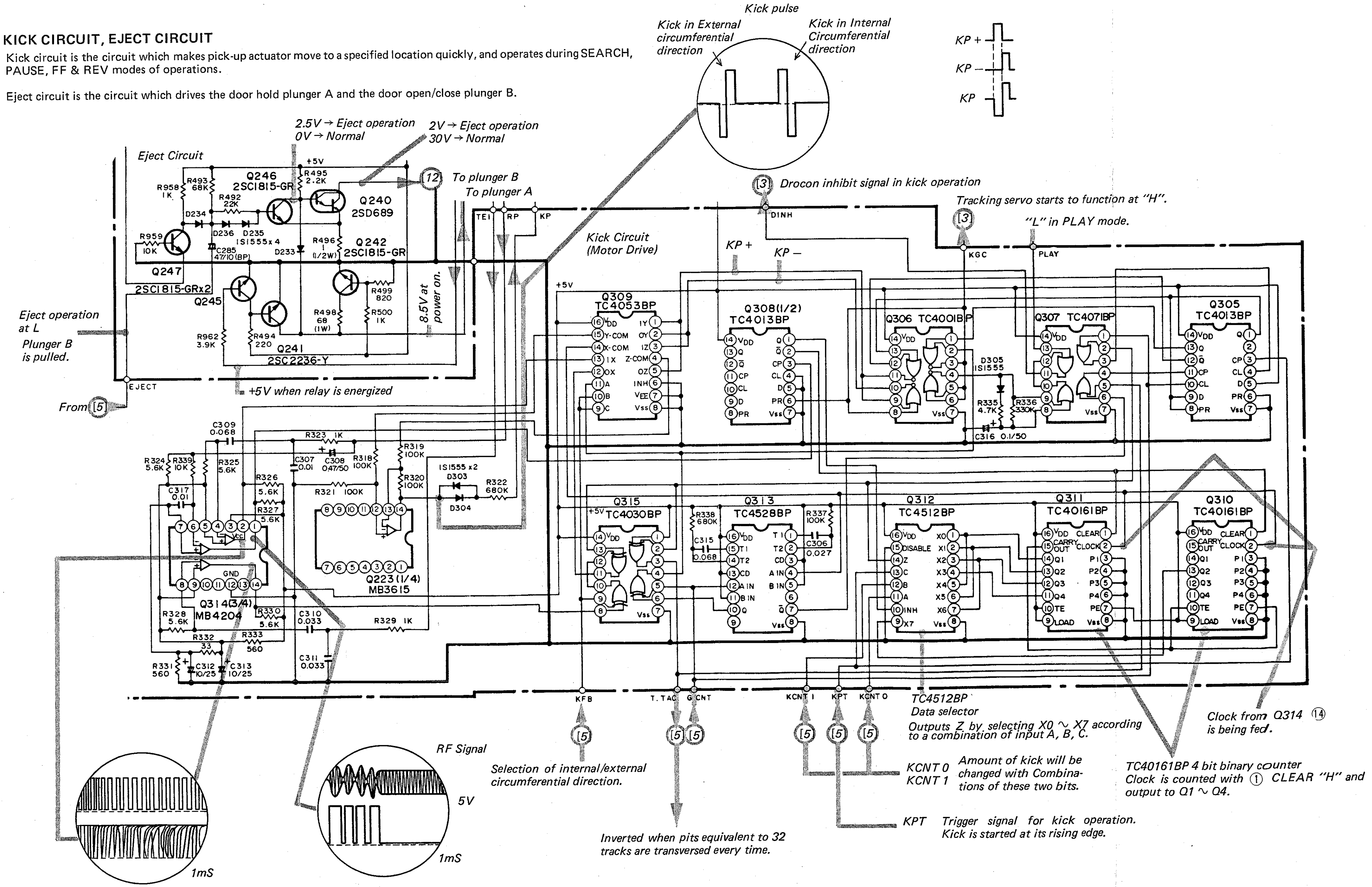

Failures relating to EJECT
Upper plunger (L001) which is always actuated (pulled) to hold door.
Lower plunger (L002) which is only actuated to open door.
Plunger
A
B
Check continuity of plunger
NG
Replace plunger
NG
Check continuity of plunger
OK
30 ∿ 40Ω
OK
30 ∿ 40Ω
Is power line +12V?
NG
[13]
NG
Is power line +30V?
OK
J-8 ②
(See Page 34)
OK
J-8 ④
(See Page 34)
Q245 collector = 0V?
Y
N
Q241
Q242
D233
Q243
Q245
Is voltage at Q246 collector 2.5V during EJECT mode?
N
Y
Q240
D233
Is $\overline{\text{EJECT}}$ from microcomputer changed to L during EJECT mode?
Y
N
[5-6]
(See Page 42)
Is voltage at Q247 collector 2.5V with door left open?
Is voltage at Q247 collector −15V with door closed?
N
Y
Q247
D234
Q246
D235
D236

In a case where plunger pulls but no operation is caused, refer to [15-3]. (See Page 87)

[4] KICK CIRCUIT, EJECT CIRCUIT

☆ Kick circuit is the circuit which makes pick-up actuator move to a specified location quickly, and operates during SEARCH, PAUSE, FF & REV modes of operations.

☆ Eject circuit is the circuit which drives the door hold plunger A and the door open/close plunger B.



Kick pulse
Kick in External circumferential direction
Kick in Internal Circumferential direction
KP +
KP −
KP
2.5V → Eject operation
0V → Normal
2V → Eject operation
30V → Normal
Eject Circuit
+5V
R958 1K
R493 68K
Q246 2SC1815-GR
R495 2.2K
Q240 2SD689
R492 22K
D234
D236 D235 1S1555x4
R959 10K
C285 47/10(BP)
D233
R496 1 (1/2W)
Q242 2SC1815-GR
Q247
2SC1815-GRx2
Q245
R499 820
R498 68 (1W)
R500 1K
R962 3.9K
R494 220
Q241 2SC2236-Y
8.5V at power on.
⑫ To plunger B
To plunger A
TEI
RP
KP
EJECT
Eject operation at L
Plunger B is pulled.
From ⑤
+5V when relay is energized
⑬ Drocon inhibit signal in kick operation
DINH
Tracking servo starts to function at "H".
"L" in PLAY mode.
⑬
KGC
PLAY
Kick Circuit (Motor Drive)
KP +
KP −
+5V
Q309 TC4053BP
Q308(1/2) TC4013BP
Q306 TC4001BP
Q307 TC4071BP
Q305 TC4013BP
D305 1S1555
R335 4.7K
R336 330K
C316 0.1/50
C309 0.068
R323 1K
R324 5.6K
R339 10K
R325 5.6K
C307 0.01
C308 0.47/50
R318 100K
R319 100K
R320 100K
1S1555x2
D303
D304
R322 680K
R321 100K
R326 5.6K
R327 5.6K
C317 0.01
Q223(1/4) MB3615
Q314(3/4) MB4204
R328 5.6K
R330 5.6K
R332 33
R333 560
C310 0.033
R329 1K
C311 0.033
R331 560
C312 10/25
C313 10/25
Q315 TC4030BP
Q313 TC4528BP
R338 680K
C315 0.068
R337 100K
C306 0.027
Q312 TC4512BP
Q311 TC40161BP
Q310 TC40161BP
KFB
T.TAC
G.CNT
KCNT 1
KPT
KCNT 0
⑤
RF Signal
5V
1mS
1mS

TC4512BP Data selector
Outputs Z by selecting X0 ∿ X7 according to a combination of input A, B, C.

Clock from Q314 ⑭ is being fed.

Selection of internal/external circumferential direction.

KCNT 0
KCNT 1
Amount of kick will be changed with Combinations of these two bits.

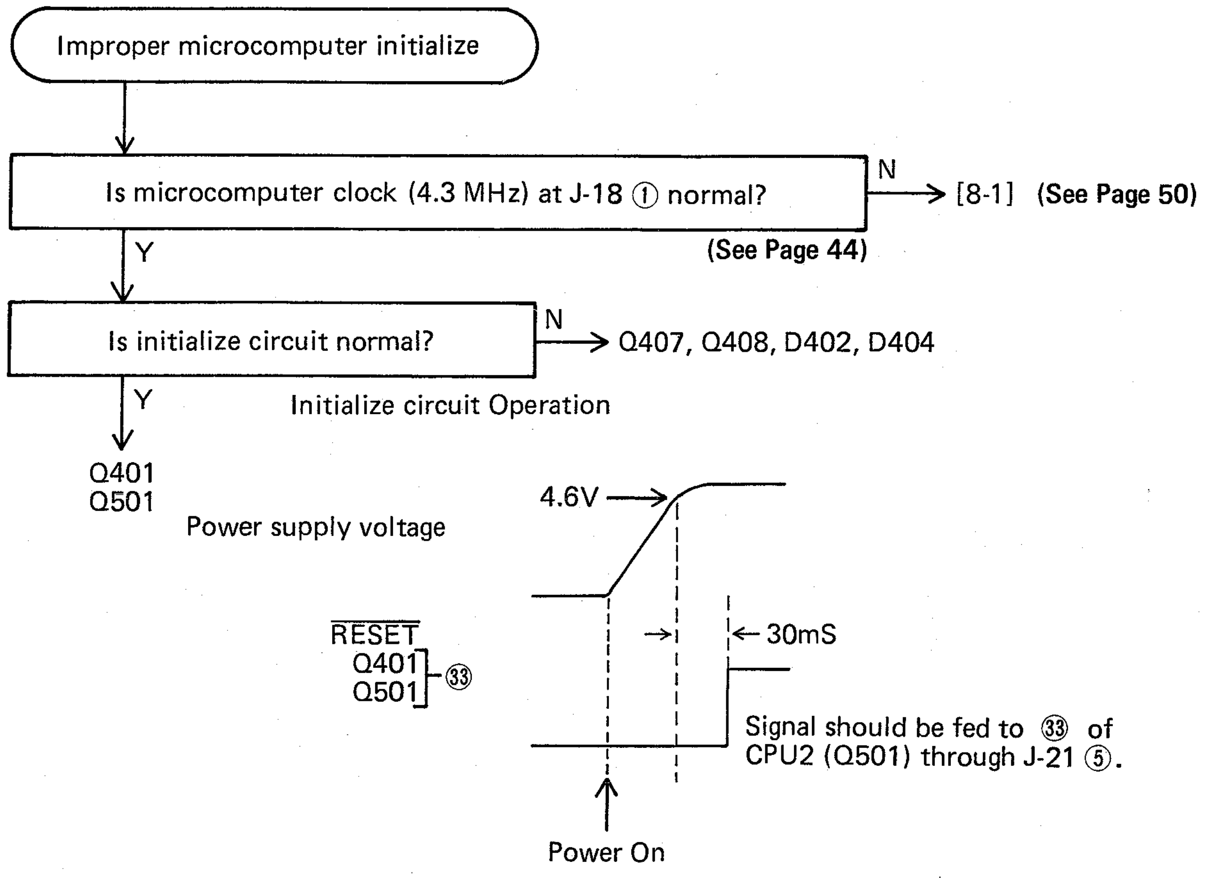
TC40161BP 4 bit binary counter
Clock is counted with ① CLEAR "H" and output to Q1 ∿ Q4.

KPT Trigger signal for kick operation. Kick is started at its rising edge.

Inverted when pits equivalent to 32 tracks are transversed every time.

[5] SYSTEM CONTROL CIRCUIT

[5-1]



Improper microcomputer initialize

Is microcomputer clock (4.3 MHz) at J-18 ① normal? (See Page 44)

N → [8-1] **(See Page 50)**

Y ↓

Is initialize circuit normal?

N → Q407, Q408, D402, D404

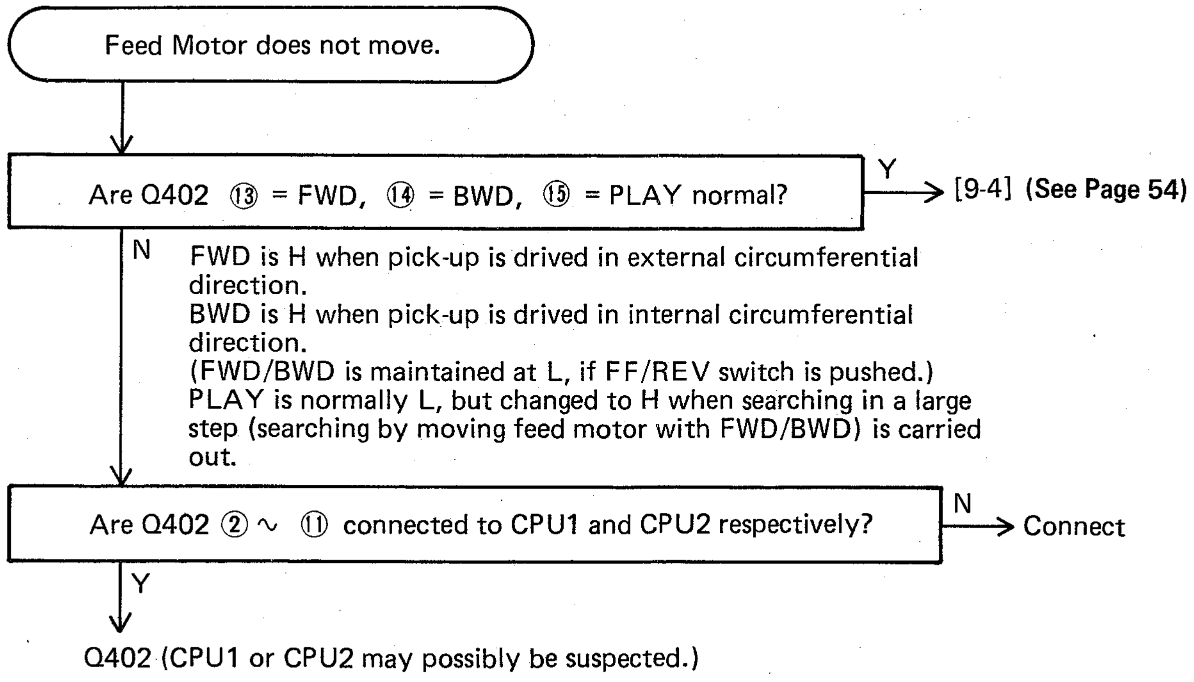
Y ↓

Q401
Q501

Initialize circuit Operation

Signal should be fed to ㉝ of CPU2 (Q501) through J-21 ⑤.

[5-2]



Feed Motor does not move.

Are Q402 ⑬ = FWD, ⑭ = BWD, ⑮ = PLAY normal?

Y → [9-4] **(See Page 54)**

N ↓

FWD is H when pick-up is drived in external circumferential direction.
BWD is H when pick-up is drived in internal circumferential direction.
(FWD/BWD is maintained at L, if FF/REV switch is pushed.)
PLAY is normally L, but changed to H when searching in a large step (searching by moving feed motor with FWD/BWD) is carried out.

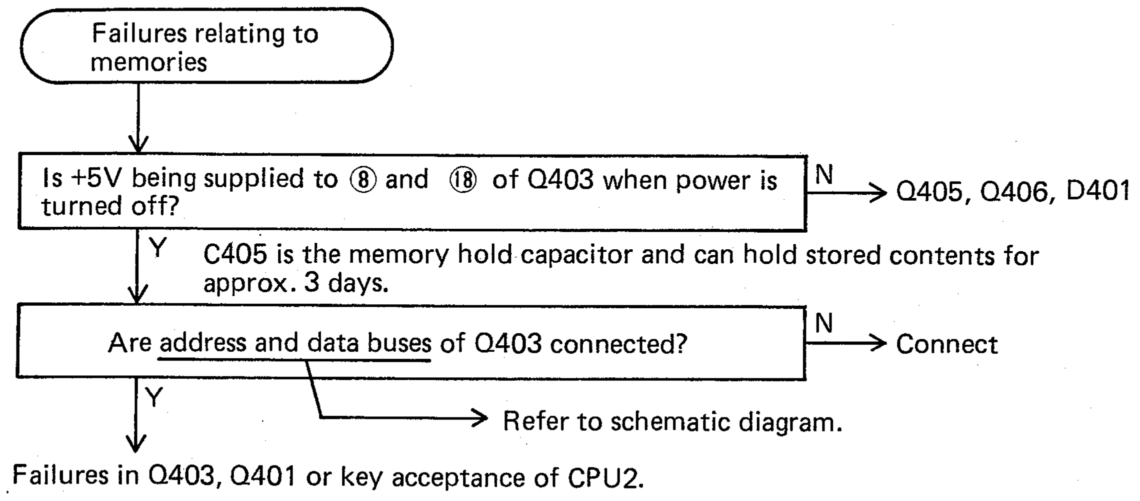
Are Q402 ② ~ ⑪ connected to CPU1 and CPU2 respectively?

N → Connect

Y ↓

Q402 (CPU1 or CPU2 may possibly be suspected.)

[5-3]



Failures relating to memories

Is +5V being supplied to ⑧ and ⑱ of Q403 when power is turned off?

N → Q405, Q406, D401

Y ↓ C405 is the memory hold capacitor and can hold stored contents for approx. 3 days.

Are address and data buses of Q403 connected?

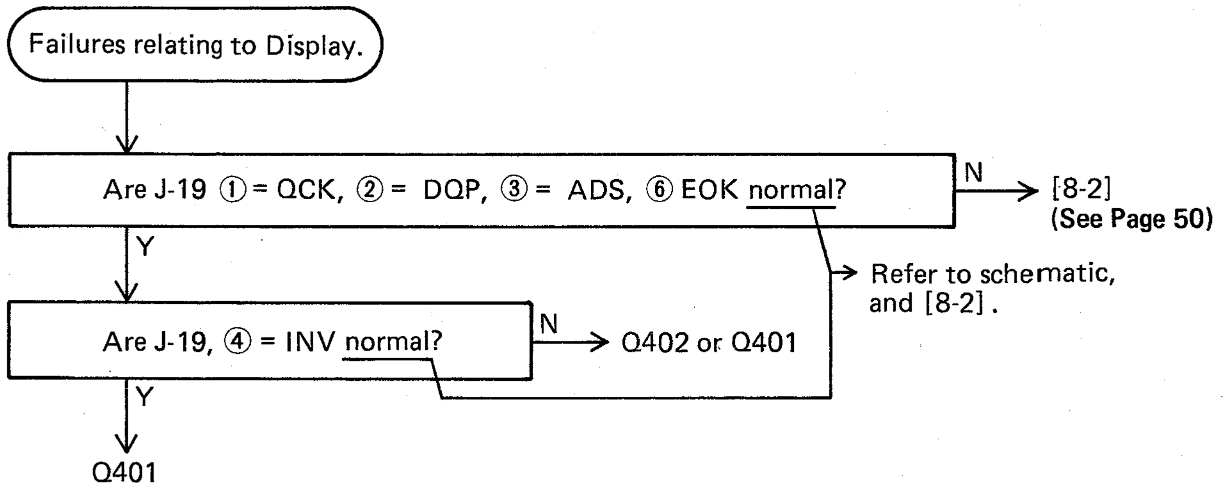
N → Connect

→ Refer to schematic diagram.

Y ↓

Failures in Q403, Q401 or key acceptance of CPU2.

[5-4]



Failures relating to Display.

Are J-19 ① = QCK, ② = DQP, ③ = ADS, ⑥ EOK normal?

N → [8-2] **(See Page 50)**

→ Refer to schematic, and [8-2].

Y ↓

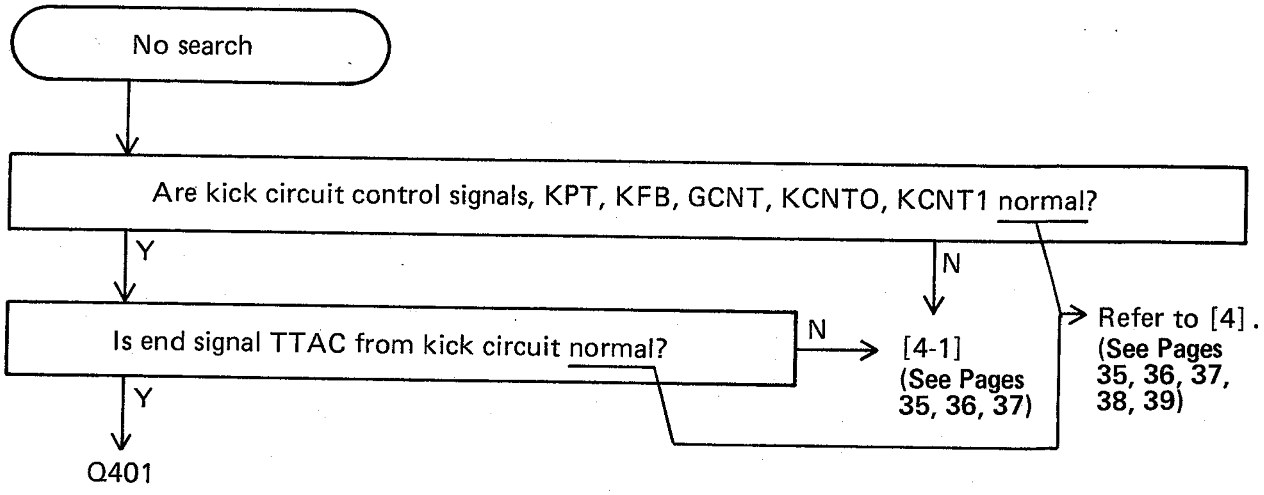
Are J-19, ④ = INV normal?

N → Q402 or Q401

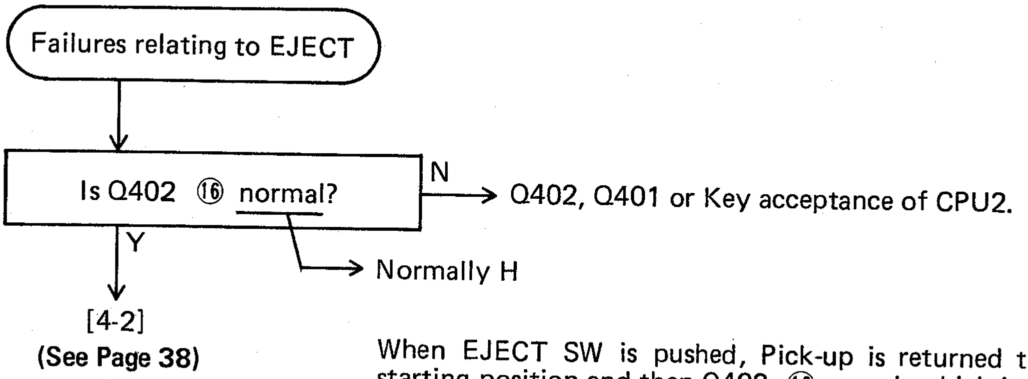
Y ↓

Q401

[5-5]

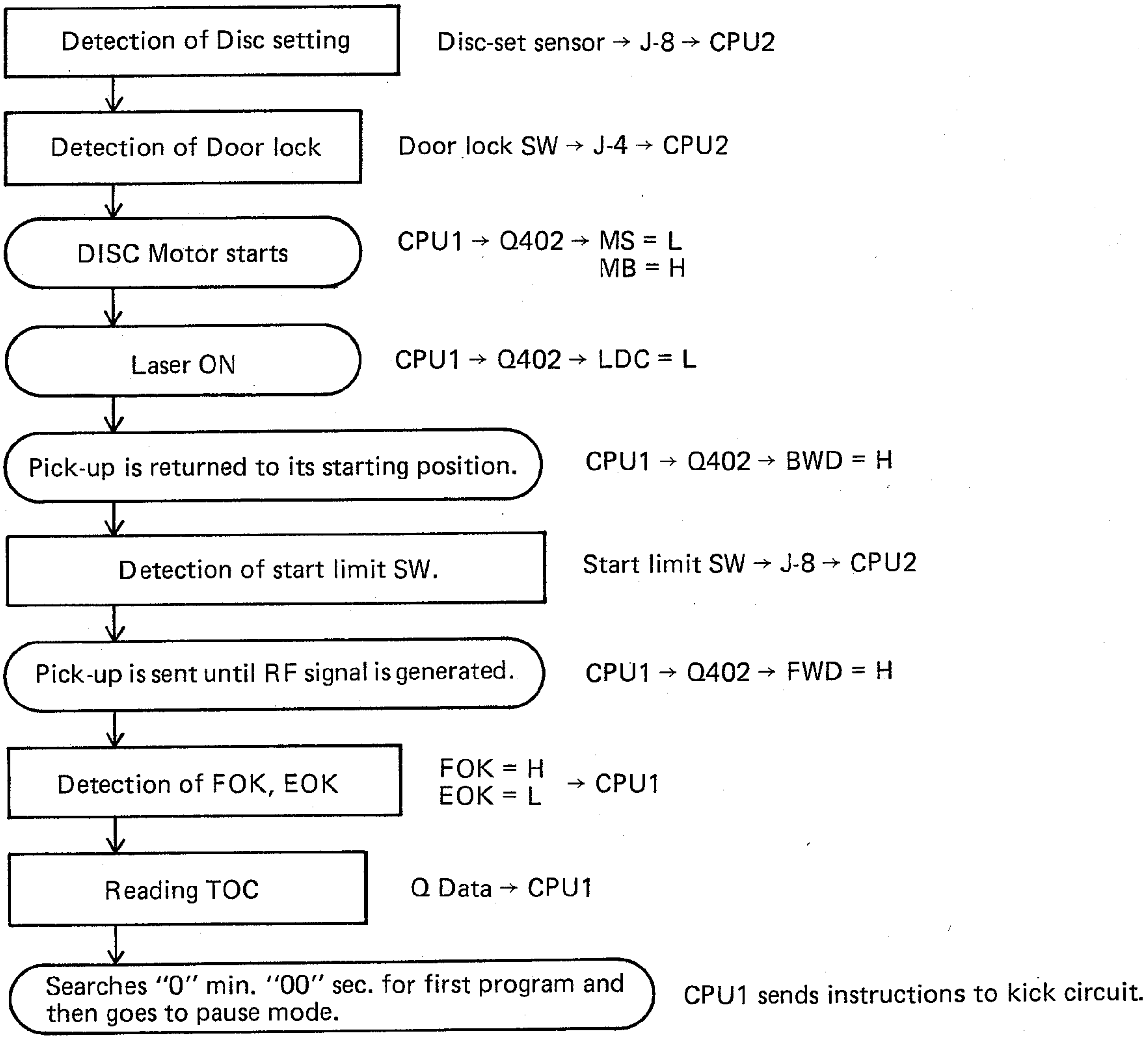

No search
Are kick circuit control signals, KPT, KFB, GCNT, KCNTO, KCNT1 normal?
Y
N
Is end signal TTAC from kick circuit normal?
N
[4-1]
(See Pages
35, 36, 37)
Refer to [4].
(See Pages
35, 36, 37,
38, 39)
Y
Q401

[5-6]

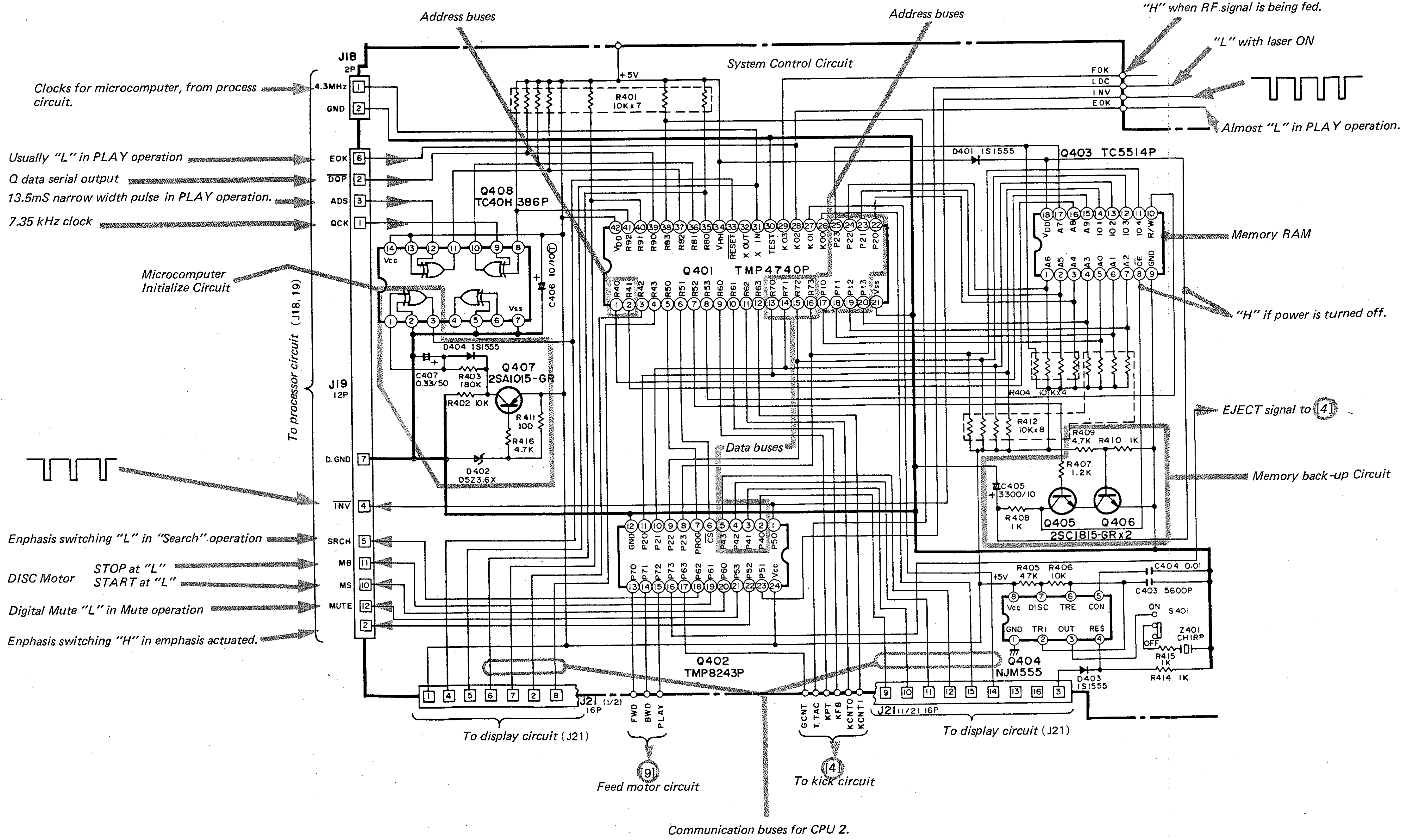

Failures relating to EJECT
Is Q402 ⑯ normal?
N
Q402, Q401 or Key acceptance of CPU2.
Normally H
Y
[4-2]
(See Page 38)

When EJECT SW is pushed, Pick-up is returned to its starting position and then Q402 ⑯ goes L which in turn makes B plunger to be pulled.

Operation Sequence from DISC Loading to PAUSE Mode for 1st Program.

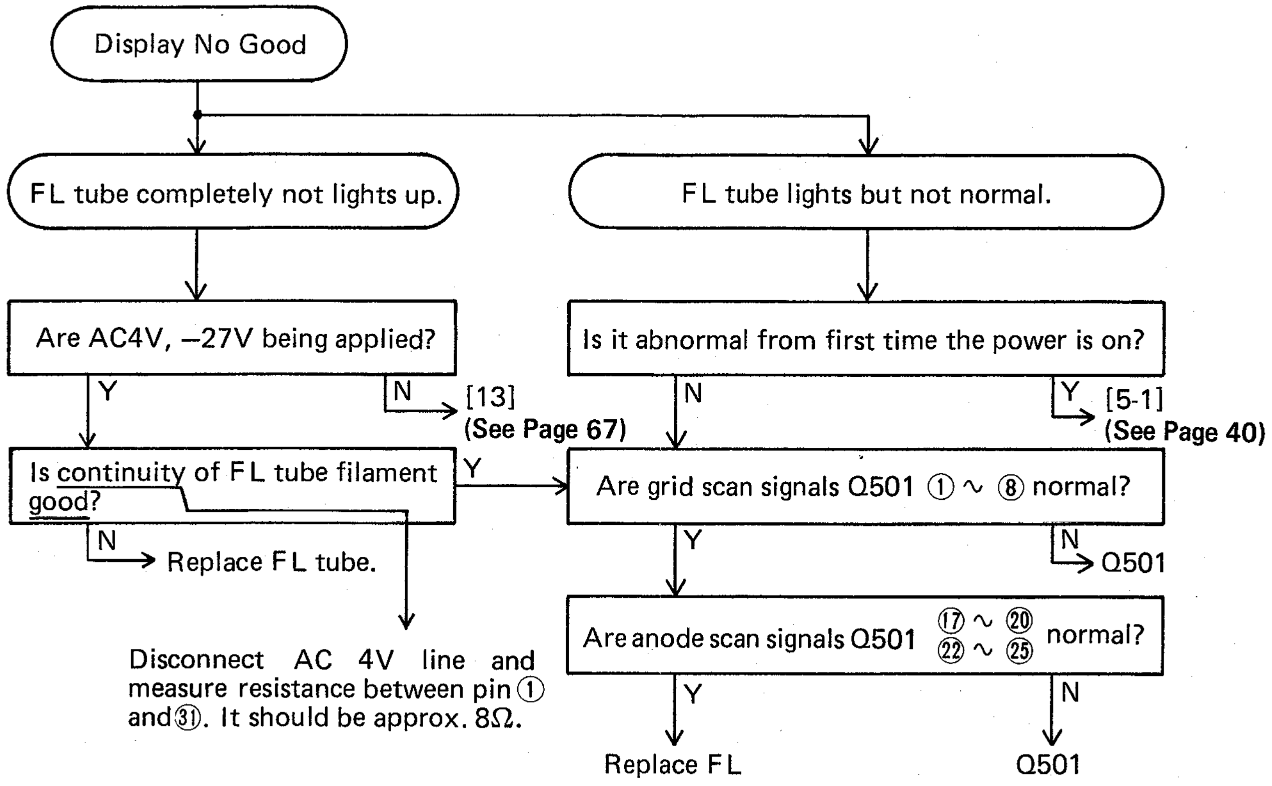

Detection of Disc setting
Disc-set sensor → J-8 → CPU2
Detection of Door lock
Door lock SW → J-4 → CPU2
DISC Motor starts
CPU1 → Q402 → MS = L
MB = H
Laser ON
CPU1 → Q402 → LDC = L
Pick-up is returned to its starting position.
CPU1 → Q402 → BWD = H
Detection of start limit SW.
Start limit SW → J-8 → CPU2
Pick-up is sent until RF signal is generated.
CPU1 → Q402 → FWD = H
Detection of FOK, EOK
FOK = H
EOK = L
→ CPU1
Reading TOC
Q Data → CPU1
Searches "0" min. "00" sec. for first program and then goes to pause mode.
CPU1 sends instructions to kick circuit.

[5] SYSTEM CONTROL CIRCUIT (CPU 1)


Address buses
Address buses
System Control Circuit
"H" when RF signal is being fed.
"L" with laser ON
Almost "L" in PLAY operation.
FOK
LDC
INV
EOK
J18
2P
4.3MHz
GND
Clocks for microcomputer, from process circuit.
Usually "L" in PLAY operation
Q data serial output
13.5mS narrow width pulse in PLAY operation.
7.35 kHz clock
EOK
DQP
ADS
QCK
+5V
R401
10K x 7
Q408
TC40H 386P
Vcc
Vss
Microcomputer Initialize Circuit
C406 10/10
Q401 TMP4740P
Data buses
D401 1S1555
Q403 TC5514P
Memory RAM
"H" if power is turned off.
To processor circuit (J18, 19)
D404 1S1555
Q407
2SA1015-GR
C407 0.33/50
R403 180K
R402 10K
R411 100
R416 4.7K
D402 05Z3.6X
J19
12P
D. GND
R404 10K x 4
R412 10K x 8
R409 4.7K
R410 1K
R407 1.2K
C405 3300/10
R408 1K
Q405
Q406
2SC1815-GR x 2
EJECT signal to [4]
Memory back-up Circuit
INV
Enphasis switching "L" in "Search" operation
SRCH
DISC Motor
STOP at "L"
START at "L"
MB
MS
Digital Mute "L" in Mute operation
MUTE
Enphasis switching "H" in emphasis actuated.
R405 47K
R406 10K
C404 0.01
C403 5600P
Vcc DISC TRE CON
GND TRI OUT RES
ON
S401
OFF
Z401 CHIRP
R415 1K
R414 1K
Q404 NJM555
D403 1S1555
Q402 TMP8243P
J21 (1/2) 16P
FWD
BWD
PLAY
GCNT
T.TAC
KPT
KFB
KCNT0
KCNT1
J21 (1/2) 16P
To display circuit (J21)
To display circuit (J21)
[9] Feed motor circuit
[4] To kick circuit
Communication buses for CPU 2.

[6] SYSTEM CONTROL (CPU 2), DISPLAY CIRCUIT

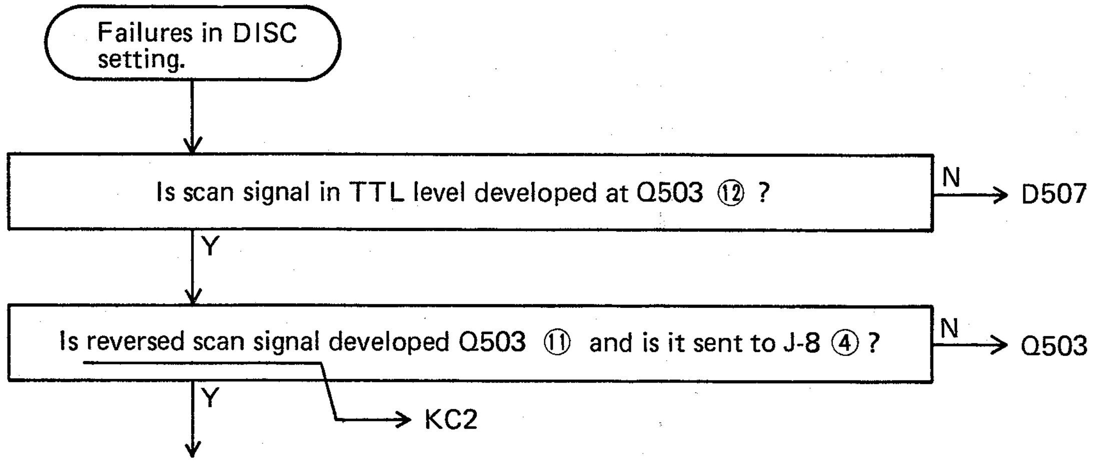
[6-1]


Display No Good
FL tube completely not lights up.
FL tube lights but not normal.
Are AC4V, –27V being applied?
Y
N
[13]
(See Page 67)
Is continuity of FL tube filament good?
Y
N
Replace FL tube.
Disconnect AC 4V line and measure resistance between pin ① and ㉛. It should be approx. 8Ω.
Is it abnormal from first time the power is on?
N
Y
[5-1]
(See Page 40)
Are grid scan signals Q501 ① ∿ ⑧ normal?
Y
N
Q501
Are anode scan signals Q501 ⑰ ∿ ⑳ ㉒ ∿ ㉕ normal?
Y
N
Replace FL
Q501

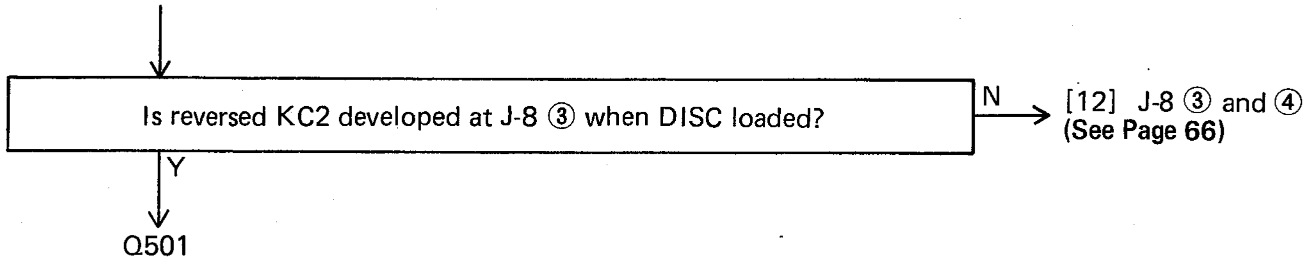
Wide Area Section (MANUAL, SEARCH, etc.) in FL Tube do not Light Up.

- Are anode scan signals in TTL level (0 ∿ 5V) being supplied to inputs of Q504 (③, ④, ⑦, ⑧, ⑬, ⑭, ⑰)?
- Is CLOCK (⑪) for Q504 being supplied?
- Is 0 ∿ 5V converted into –30 ∿ 5V at Q505?

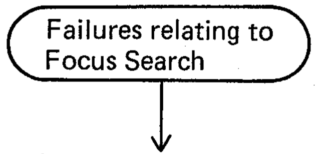
[6-2]


Failures in DISC setting.
Is scan signal in TTL level developed at Q503 ⑫ ?
N
D507
Y
Is reversed scan signal developed Q503 ⑪ and is it sent to J-8 ④ ?
N
Q503
Y
KC2

(Continued to next page.)


Is reversed KC2 developed at J-8 ③ when DISC loaded?
N
[12] J-8 ③ and ④
(See Page 66)
Y
Q501

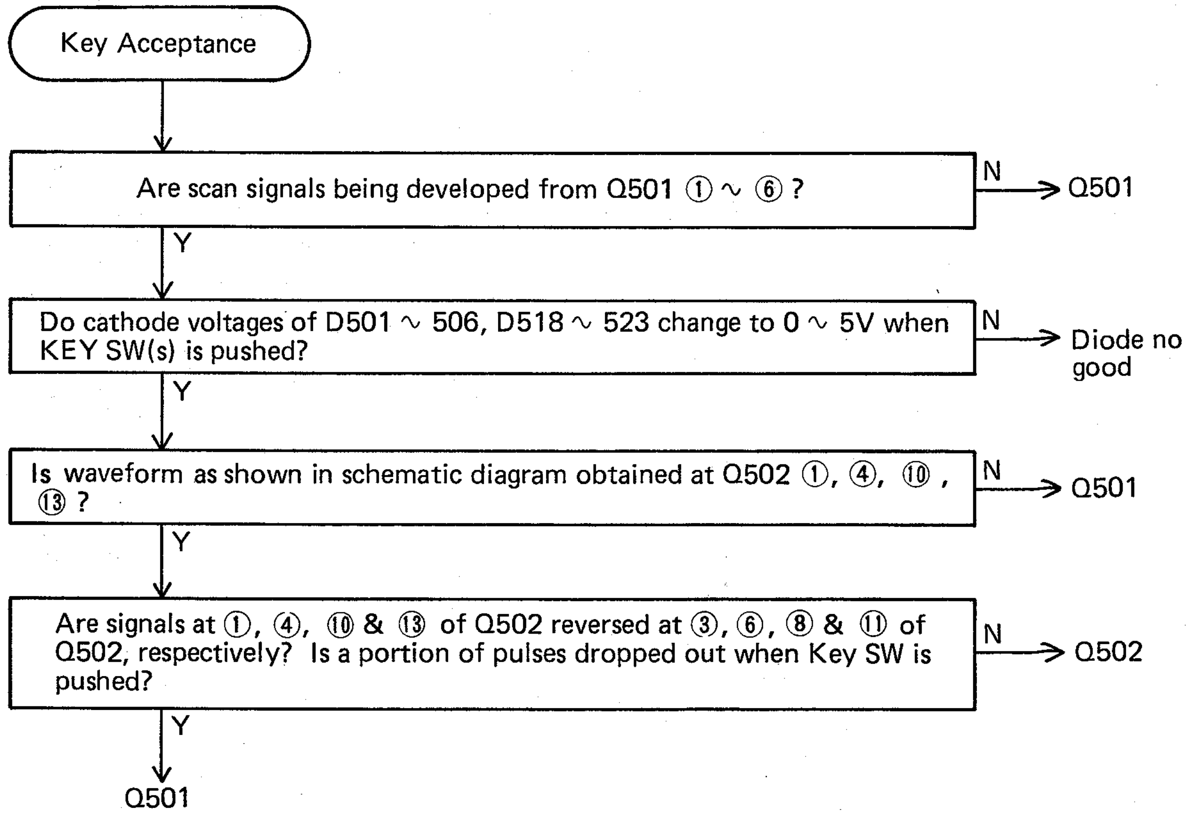
[6-3]


Failures relating to Focus Search

Is 3 Hz rectangular waveform developed at Q501 ⑫ 0.6 sec. after the START LIMIT SW is pushed?

If developed, "[2] Focus servo circuit" will be suspected, or if not developed Q501 will be suspected?

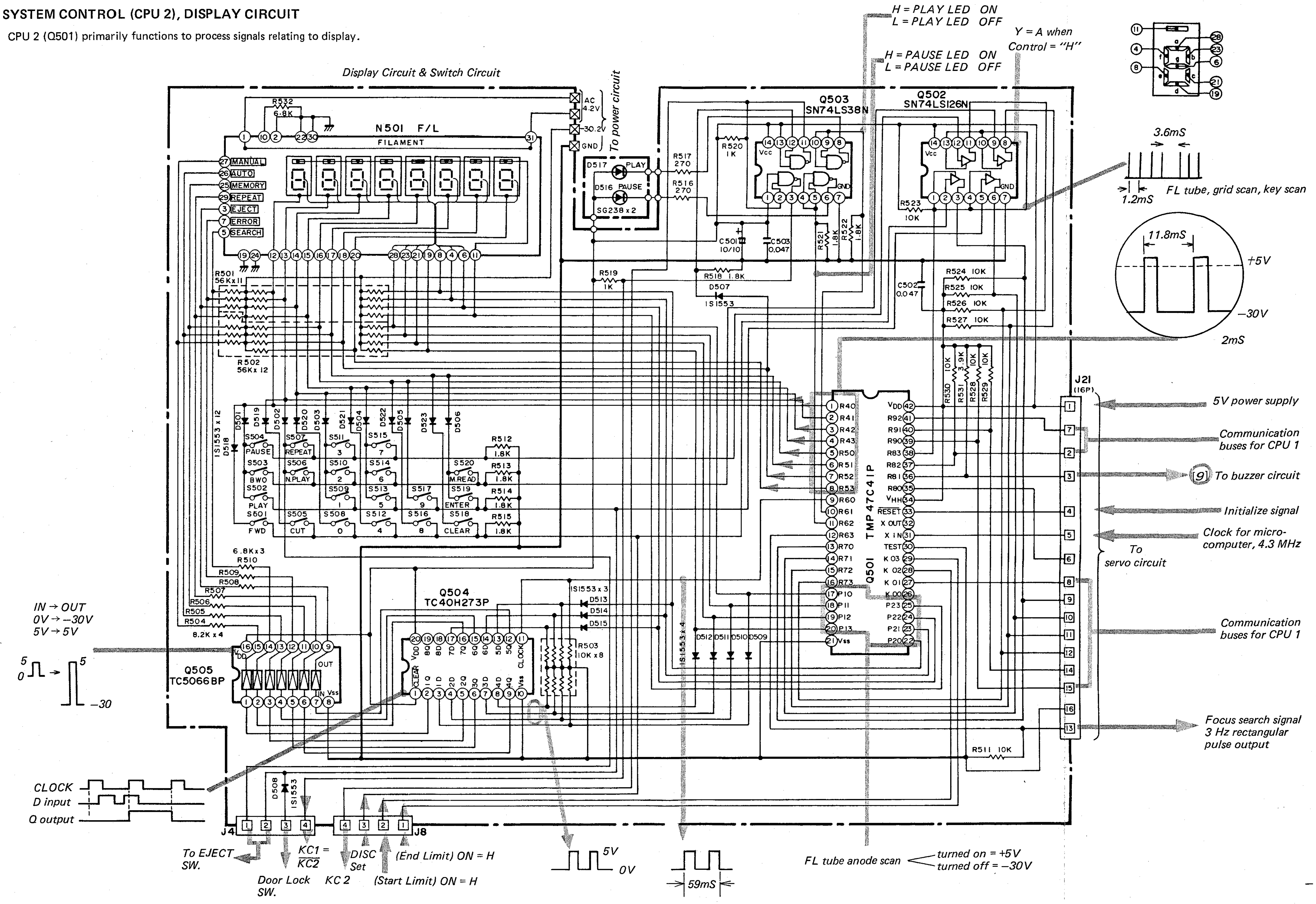
[6-4]


Key Acceptance
Are scan signals being developed from Q501 ① ∿ ⑥ ?
N
Q501
Y
Do cathode voltages of D501 ∿ 506, D518 ∿ 523 change to 0 ∿ 5V when KEY SW(s) is pushed?
N
Diode no good
Y
Is waveform as shown in schematic diagram obtained at Q502 ①, ④, ⑩, ⑬ ?
N
Q501
Y
Are signals at ①, ④, ⑩ & ⑬ of Q502 reversed at ③, ⑥, ⑧ & ⑪ of Q502, respectively? Is a portion of pulses dropped out when Key SW is pushed?
N
Q502
Y
Q501

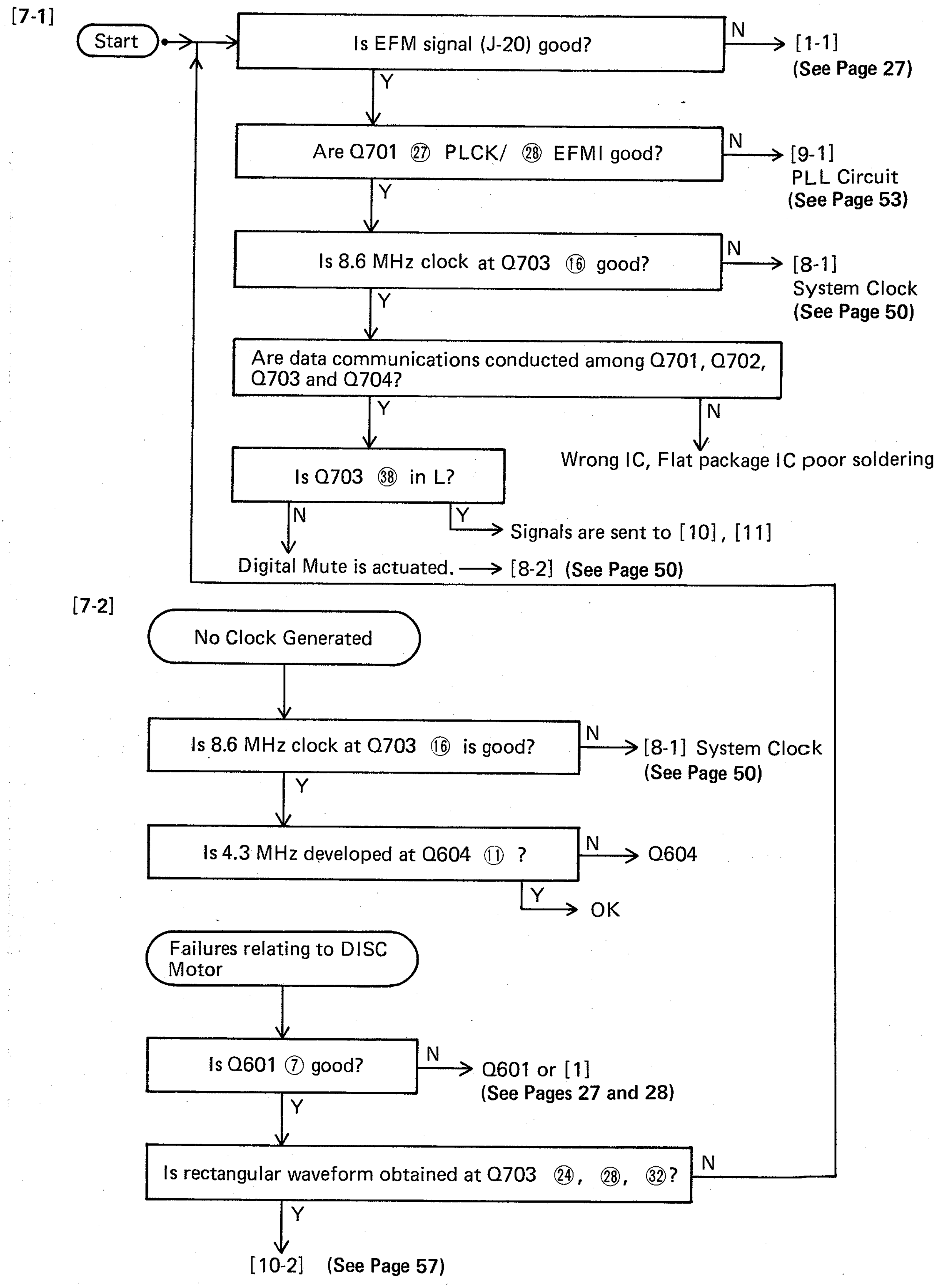
Note: A high voltage (AC 4V, –27V) is being applied to the Display P.C. Board to drive the FL tube, so pay attention when check the board.

[6] SYSTEM CONTROL (CPU 2), DISPLAY CIRCUIT

☆ CPU 2 (Q501) primarily functions to process signals relating to display.

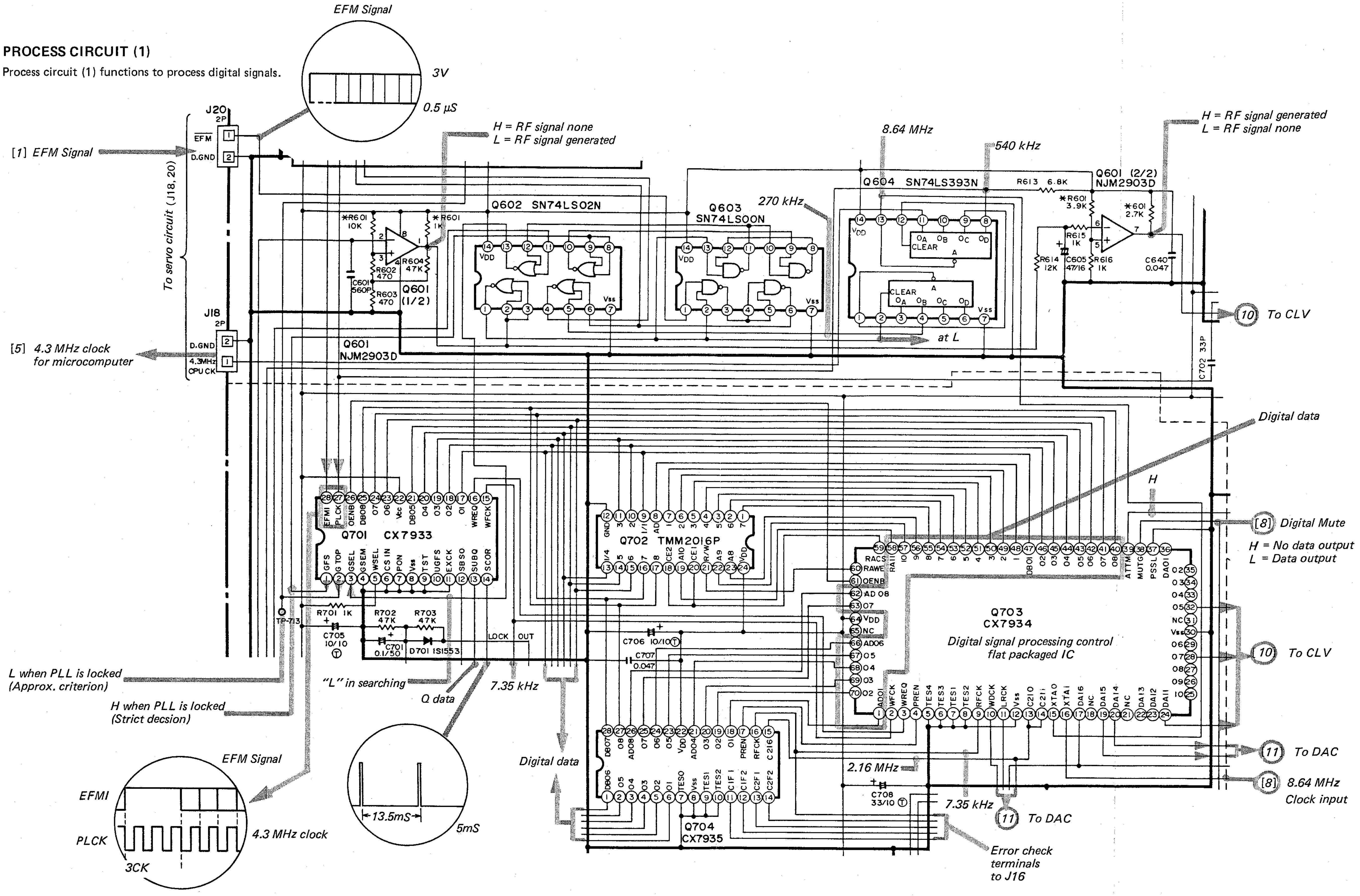

Display Circuit & Switch Circuit
N501 F/L
FILAMENT
MANUAL
AUTO
MEMORY
REPEAT
EJECT
ERROR
SEARCH
R532 6.8K
R501 56K x 11
R502 56K x 12
AC 4.2V
-30.2V
GND
To power circuit
D517 PLAY
D516 PAUSE
SG238 x 2
R517 270
R516 270
R519 1K
R518 1.8K
D507 1S1553
R520 1K
C501 10/10
C503 0.047
C502 0.047
R521 1.8K
R522 1.8K
Q503 SN74LS38N
Q502 SN74LS126N
R523 10K
R524 10K
R525 10K
R526 10K
R527 10K
R530 10K
R531 3.9K
R528 10K
R529 10K
H = PLAY LED ON
L = PLAY LED OFF
H = PAUSE LED ON
L = PAUSE LED OFF
Y = A when Control = "H"
3.6mS
1.2mS
FL tube, grid scan, key scan
11.8mS
+5V
-30V
2mS
1S1553 x 12
D501 D519 D502 D520 D503 D521 D504 D522 D505 D523 D506 D518
S504 PAUSE
S503 BWO
S502 PLAY
S501 FWD
S507 REPEAT
S506 N.PLAY
S505 CUT
S511 3
S510 2
S509 1
S508 0
S515 7
S514 6
S513 5
S512 4
S517 9
S516 8
S520 M.READ
S519 ENTER
S518 CLEAR
R512 1.8K
R513 1.8K
R514 1.8K
R515 1.8K
6.8K x 3
R510
R509
R508
R507
R506
R505
R504
8.2K x 4
Q505 TC5066BP
VDD OUT IN Vss
Q504 TC40H273P
CLEAR VDD CLOCK Vss
1Q 1D 2D 2Q 3Q 3D 4D 4Q 5Q 5D 6D 6Q 7Q 7D 8D 8Q
1S1553 x 3
D513 D514 D515
R503 10K x 8
1S1553 x 4
D512 D511 D510 D509
Q501 TMP47C41P
R40 R41 R42 R43 R50 R51 R52 R53 R60 R61 R62 R63 R70 R71 R72 R73 P10 P11 P12 P13 Vss
VDD R92 R91 R90 R83 R82 R81 R80 VHH RESET X OUT X IN TEST K03 K02 K01 K00 P23 P22 P21 P20
J21 (16P)
5V power supply
Communication buses for CPU 1
⑨ To buzzer circuit
Initialize signal
Clock for micro-computer, 4.3 MHz
To servo circuit
Communication buses for CPU 1
Focus search signal 3 Hz rectangular pulse output
R511 10K
IN → OUT
0V → -30V
5V → 5V
5
0
5
-30
CLOCK
D input
Q output
J4
J8
D508 1S1553
To EJECT SW.
Door Lock SW.
KC1 = KC2
KC 2
DISC Set
(End Limit) ON = H
(Start Limit) ON = H
5V
0V
59mS
FL tube anode scan
turned on = +5V
turned off = -30V

[7] PROCESS CIRCUIT (1)


[7-1]
Start
Is EFM signal (J-20) good?
N
[1-1]
(See Page 27)
Y
Are Q701 ㉗ PLCK/ ㉘ EFMI good?
N
[9-1]
PLL Circuit
(See Page 53)
Y
Is 8.6 MHz clock at Q703 ⑯ good?
N
[8-1]
System Clock
(See Page 50)
Y
Are data communications conducted among Q701, Q702, Q703 and Q704?
Y
N
Wrong IC, Flat package IC poor soldering
Is Q703 ㊳ in L?
N
Y
Signals are sent to [10], [11]
Digital Mute is actuated.
[8-2] (See Page 50)
[7-2]
No Clock Generated
Is 8.6 MHz clock at Q703 ⑯ is good?
N
[8-1] System Clock
(See Page 50)
Y
Is 4.3 MHz developed at Q604 ⑪ ?
N
Q604
Y
OK
Failures relating to DISC Motor
Is Q601 ⑦ good?
N
Q601 or [1]
(See Pages 27 and 28)
Y
Is rectangular waveform obtained at Q703 ㉔, ㉘, ㉜?
N
Y
[10-2] (See Page 57)

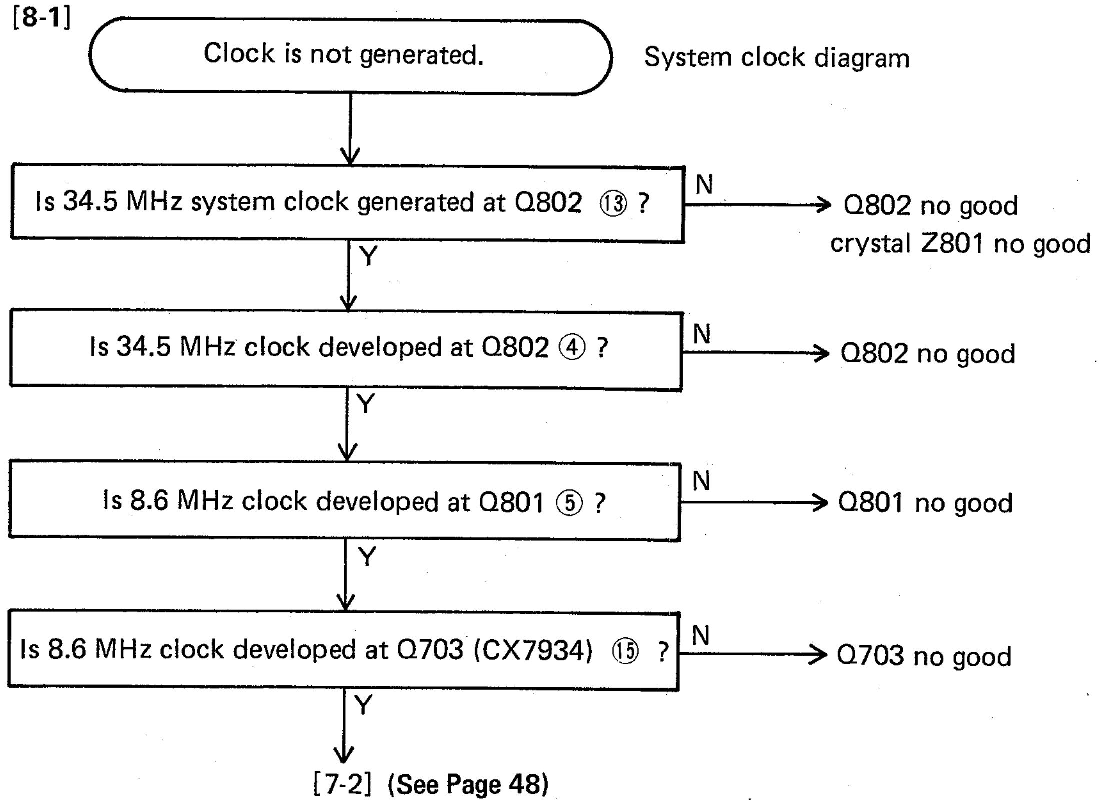
[7] PROCESS CIRCUIT (1)

☆ Process circuit (1) functions to process digital signals.

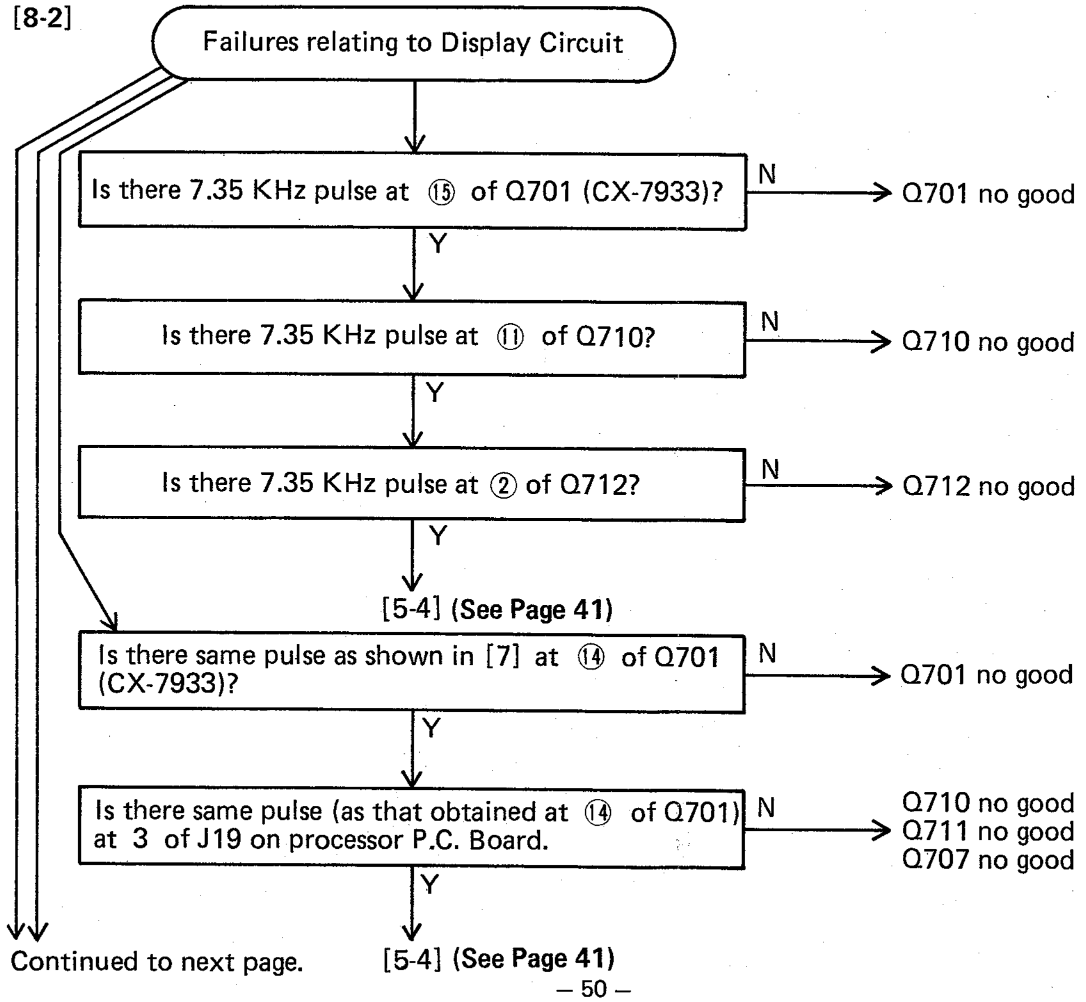

EFM Signal
3V
0.5 μS
[1] EFM Signal
J20
2P
EFM
D.GND
To servo circuit (J18, 20)
J18
2P
D.GND
4.3MHz
CPU CK
[5] 4.3 MHz clock for microcomputer
H = RF signal none
L = RF signal generated
*R601 10K
*R601 1K
R602 470
R603 470
R604 47K
C601 560P
Q601 (1/2)
Q601 NJM2903D
Q602 SN74LS02N
Q603 SN74LS00N
270 kHz
8.64 MHz
540 kHz
Q604 SN74LS393N
CLEAR
at L
R613 6.8K
*R601 3.9K
*601 2.7K
R615 1K
R614 12K
C605 47/16
R616 1K
C640 0.047
Q601 (2/2) NJM2903D
H = RF signal generated
L = RF signal none
[10] To CLV
C702 33P
Digital data
H
[8] Digital Mute
H = No data output
L = Data output
Q701 CX7933
EFMI
PLCK
OENB
DB08
07
06
Vcc
DB05
04
03
02
01
WREQ
WFCK
GFS
G TOP
GSEL
GSEM
WSEL
CS IN
PON
Vss
TST
UGFS
EXCK
SBSO
SUBQ
SCOR
Q702 TMM2016P
Q703 CX7934
Digital signal processing control flat packaged IC
[10] To CLV
[11] To DAC
[8] 8.64 MHz Clock input
Q704 CX7935
TP-713
R701 1K
C705 10/10
R702 47K
R703 47K
C701 0.1/50
D701 IS1553
LOCK
OUT
C706 10/10
C707 0.047
C708 33/10
2.16 MHz
7.35 kHz
[11] To DAC
Error check terminals to J16
L when PLL is locked (Approx. criterion)
H when PLL is locked (Strict decsion)
"L" in searching
Q data
7.35 kHz
Digital data
EFM Signal
EFMI
PLCK
3CK
4.3 MHz clock
13.5mS
5mS

[8] SYSTEM CLOCK CIRCUIT, PROCESS CIRCUIT (2)

[8-1]

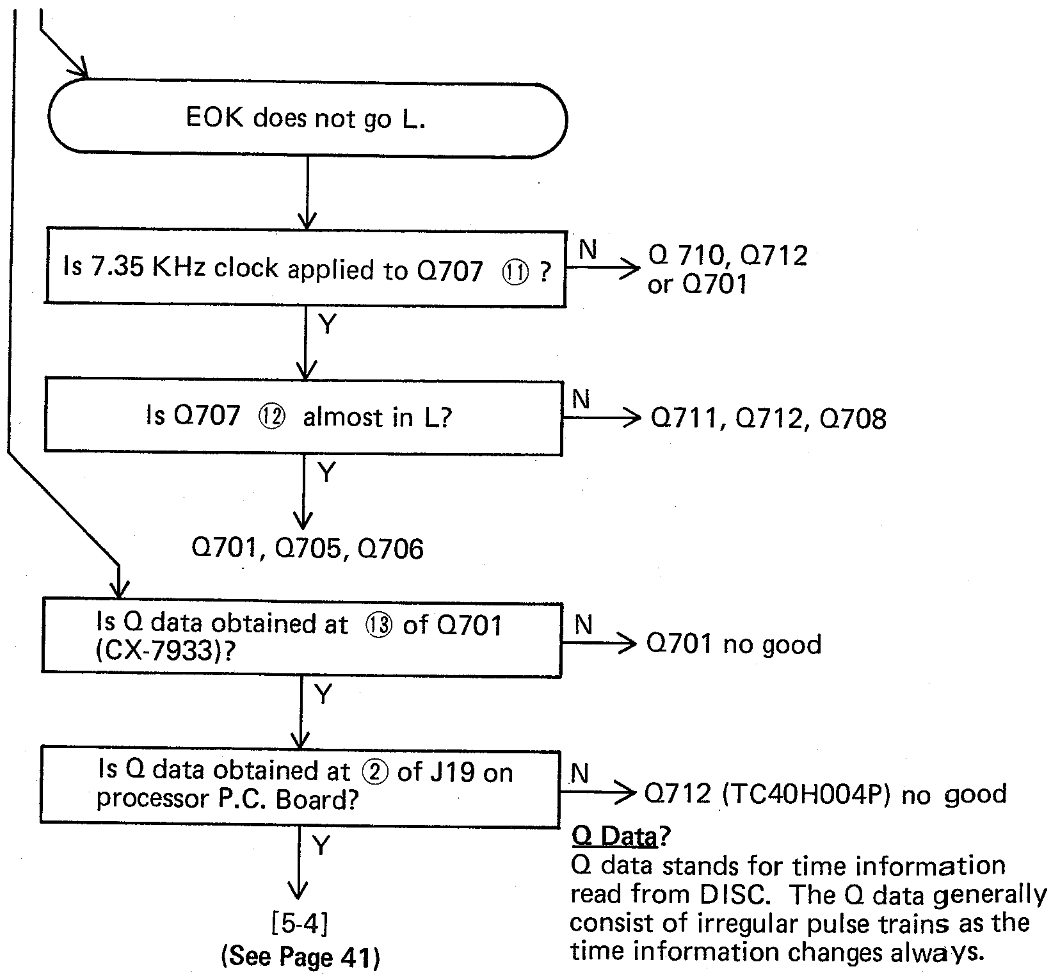

Clock is not generated.
System clock diagram
Is 34.5 MHz system clock generated at Q802 ⑬ ?
N
Q802 no good
crystal Z801 no good
Y
Is 34.5 MHz clock developed at Q802 ④ ?
N
Q802 no good
Y
Is 8.6 MHz clock developed at Q801 ⑤ ?
N
Q801 no good
Y
Is 8.6 MHz clock developed at Q703 (CX7934) ⑮ ?
N
Q703 no good
Y
[7-2] (See Page 48)

[8-2]


Failures relating to Display Circuit
Is there 7.35 KHz pulse at ⑮ of Q701 (CX-7933)?
N
Q701 no good
Y
Is there 7.35 KHz pulse at ⑪ of Q710?
N
Q710 no good
Y
Is there 7.35 KHz pulse at ② of Q712?
N
Q712 no good
Y
[5-4] (See Page 41)
Is there same pulse as shown in [7] at ⑭ of Q701 (CX-7933)?
N
Q701 no good
Y
Is there same pulse (as that obtained at ⑭ of Q701) at 3 of J19 on processor P.C. Board.
N
Q710 no good
Q711 no good
Q707 no good
Y
[5-4] (See Page 41)

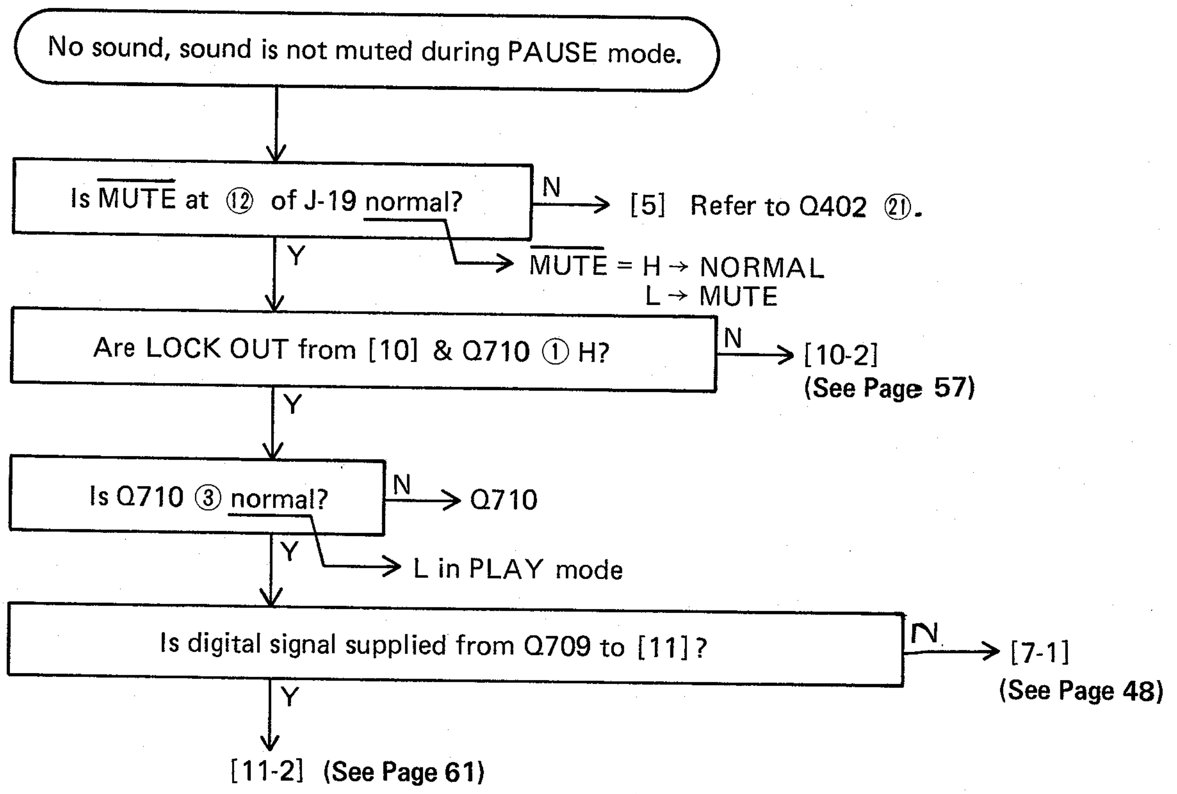
Continued to next page.

[8-3]


EOK does not go L.
Is 7.35 KHz clock applied to Q707 ⑪ ?
N
Q 710, Q712
or Q701
Y
Is Q707 ⑫ almost in L?
N
Q711, Q712, Q708
Y
Q701, Q705, Q706
Is Q data obtained at ⑬ of Q701 (CX-7933)?
N
Q701 no good
Y
Is Q data obtained at ② of J19 on processor P.C. Board?
N
Q712 (TC40H004P) no good
Y
[5-4]
(See Page 41)

Q Data?
Q data stands for time information read from DISC. The Q data generally consist of irregular pulse trains as the time information changes always.

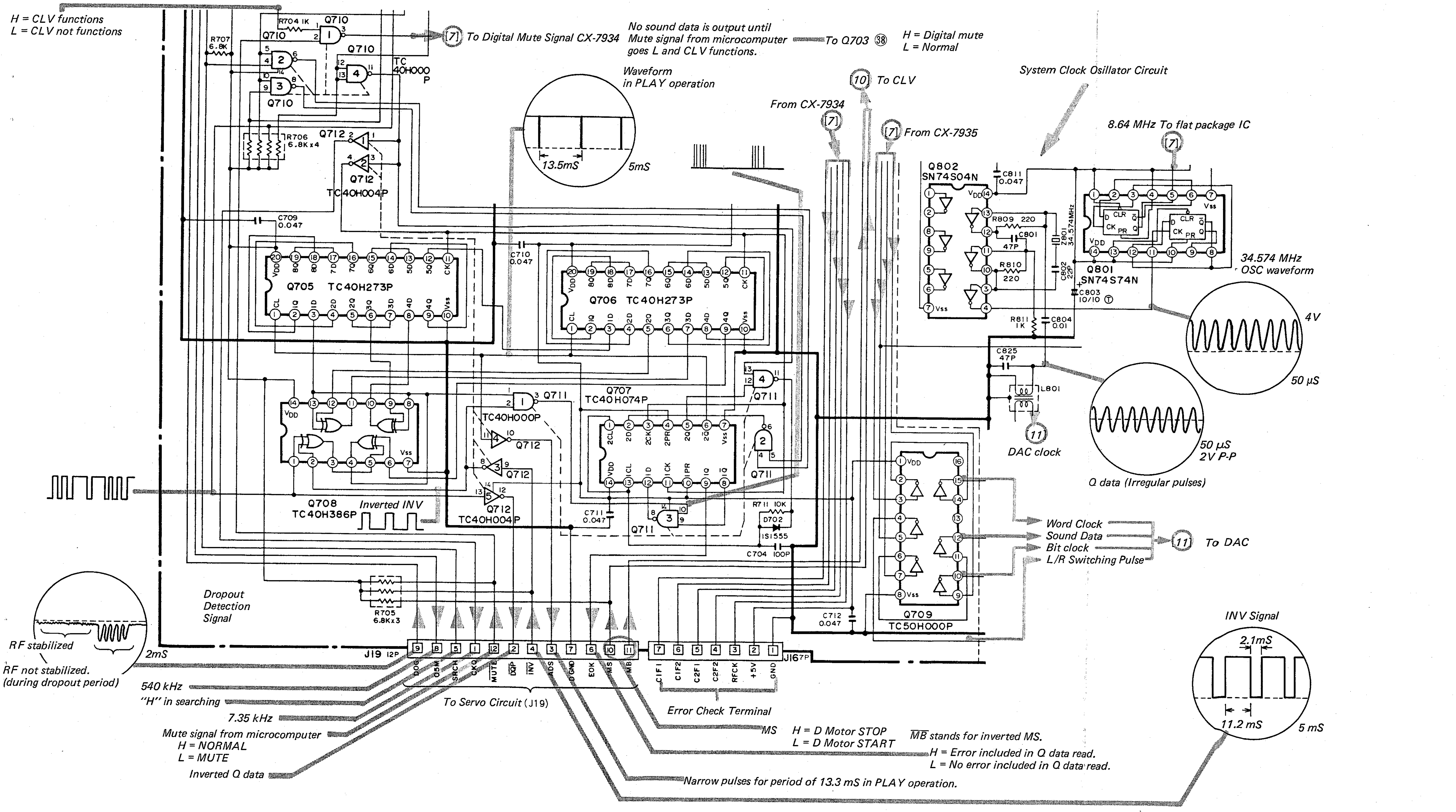
[8-4]


No sound, sound is not muted during PAUSE mode.
Is $\overline{\text{MUTE}}$ at ⑫ of J-19 normal?
N
[5] Refer to Q402 ㉑.
$\overline{\text{MUTE}}$ = H → NORMAL
L → MUTE
Y
Are LOCK OUT from [10] & Q710 ① H?
N
[10-2]
(See Page 57)
Y
Is Q710 ③ normal?
N
Q710
L in PLAY mode
Y
Is digital signal supplied from Q709 to [11] ?
N
[7-1]
(See Page 48)
Y
[11-2] (See Page 61)

[8] SYSTEM CLOCK CIRCUIT, PROCESS CIRCUIT (2)

☆ Process circuit (2) processes Q data for displaying.

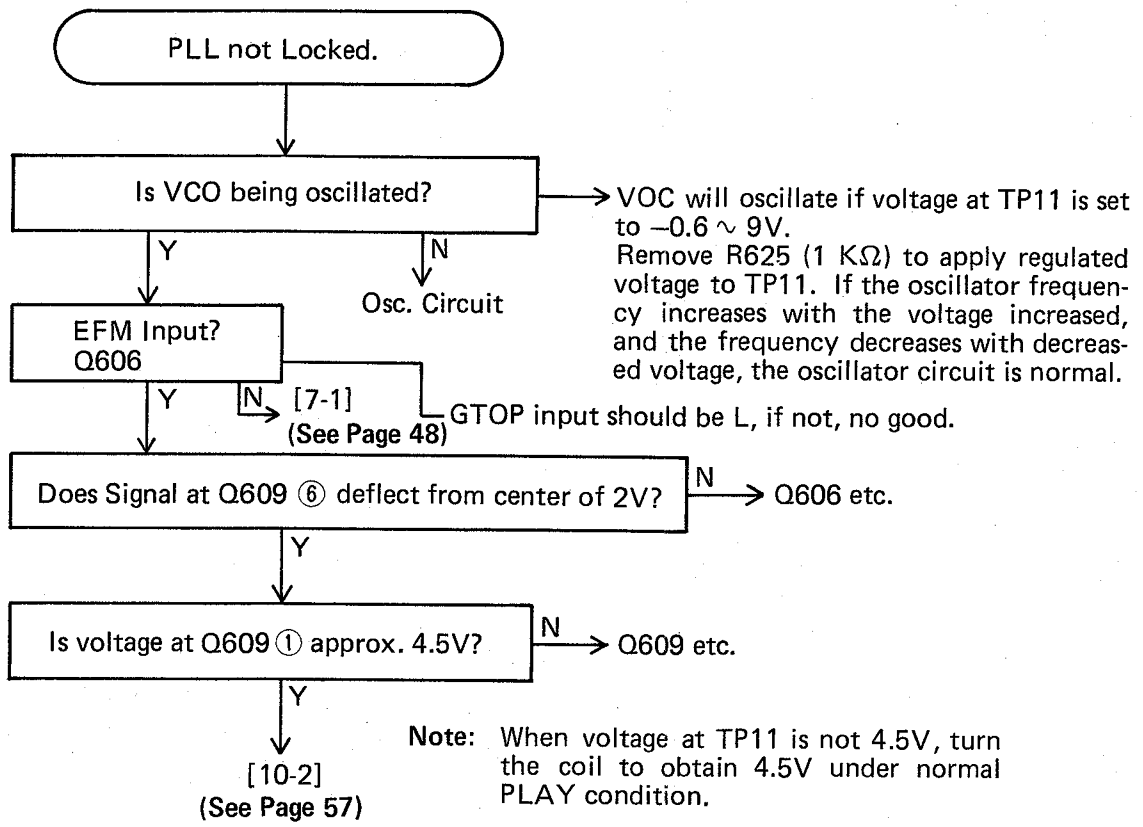
☆ System clock is the oscillator generating a reference frequency used for clock signal supplied to all ICs. Unit do not operate at all if the system clock does not oscillate.



H = CLV functions
L = CLV not functions
R707 6.8K
R704 1K
Q710
TC40H000P
R706 6.8K x4
Q712
TC40H004P
To Digital Mute Signal CX-7934
No sound data is output until Mute signal from microcomputer goes L and CLV functions.
To Q703 ㊳
H = Digital mute
L = Normal
Waveform in PLAY operation
13.5mS
5mS
To CLV
From CX-7934
From CX-7935
System Clock Oscillator Circuit
8.64 MHz To flat package IC
Q802 SN74S04N
C811 0.047
R809 220
C801 47P
R810 220
Z801 34.574MHz
C802 22P
C803 10/10
R811 1K
C804 0.01
Q801 SN74S74N
34.574 MHz OSC waveform
4V
50 µS
C709 0.047
C710 0.047
Q705 TC40H273P
Q706 TC40H273P
Q707 TC40H074P
Q711
Q708 TC40H386P
Inverted INV
C711 0.047
R711 10K
D702 1S1555
C704 100P
C825 47P
L801
DAC clock
50 µS 2V P-P
Q data (Irregular pulses)
Q709 TC50H000P
Word Clock
Sound Data
Bit clock
L/R Switching Pulse
To DAC
C712 0.047
Dropout Detection Signal
R705 6.8K x3
RF stabilized
RF not stabilized. (during dropout period)
2mS
J19 12P
J16 7P
DOG
O5M
SRCH
CKQ
MUTE
DQP
INV
ADS
D GND
EOK
MS
MB
C1F1
C1F2
C2F1
C2F2
RFCK
+5V
GND
540 kHz
"H" in searching
7.35 kHz
Mute signal from microcomputer
H = NORMAL
L = MUTE
Inverted Q data
To Servo Circuit (J19)
Error Check Terminal
MS H = D Motor STOP
L = D Motor START
MB stands for inverted MS.
H = Error included in Q data read.
L = No error included in Q data read.
Narrow pulses for period of 13.3 mS in PLAY operation.
INV Signal
2.1mS
11.2 mS
5 mS

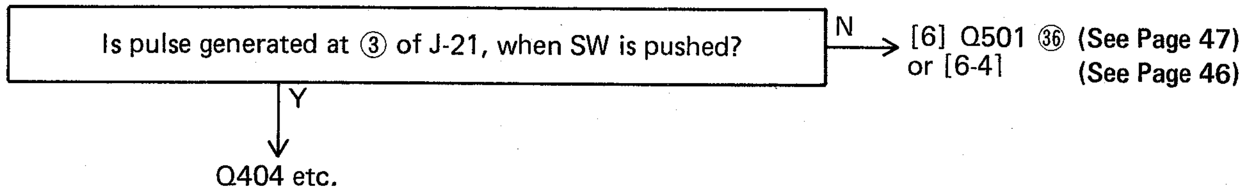
[9] PLL, BUZZER, FEED MOTOR CIRCUIT

[9-1]

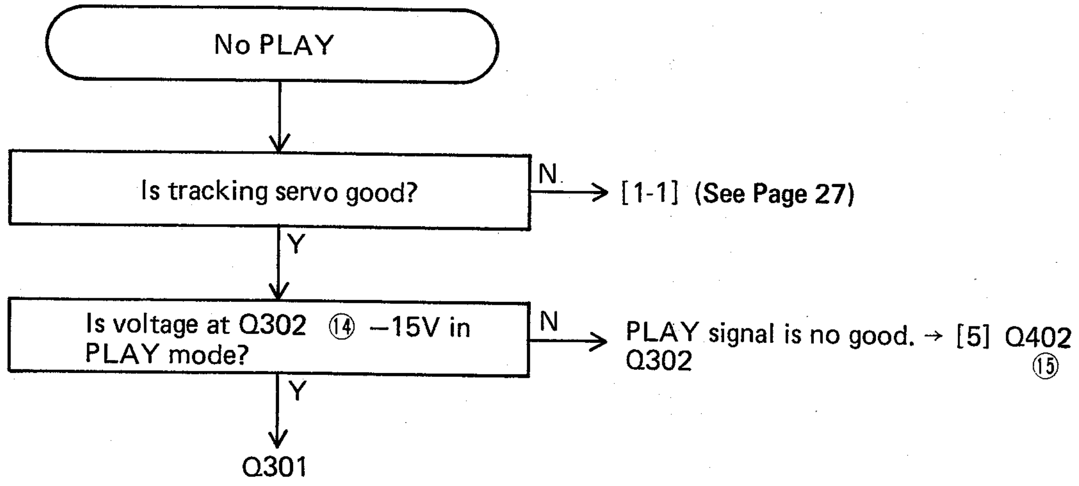

PLL not Locked.
Is VCO being oscillated?
VOC will oscillate if voltage at TP11 is set to –0.6 ∿ 9V.
Remove R625 (1 KΩ) to apply regulated voltage to TP11. If the oscillator frequency increases with the voltage increased, and the frequency decreases with decreased voltage, the oscillator circuit is normal.
Y
N
Osc. Circuit
EFM Input?
Q606
Y
N
[7-1]
(See Page 48)
GTOP input should be L, if not, no good.
Does Signal at Q609 ⑥ deflect from center of 2V?
N
Q606 etc.
Y
Is voltage at Q609 ① approx. 4.5V?
N
Q609 etc.
Y
[10-2]
(See Page 57)

Note: When voltage at TP11 is not 4.5V, turn the coil to obtain 4.5V under normal PLAY condition.

[9-2]

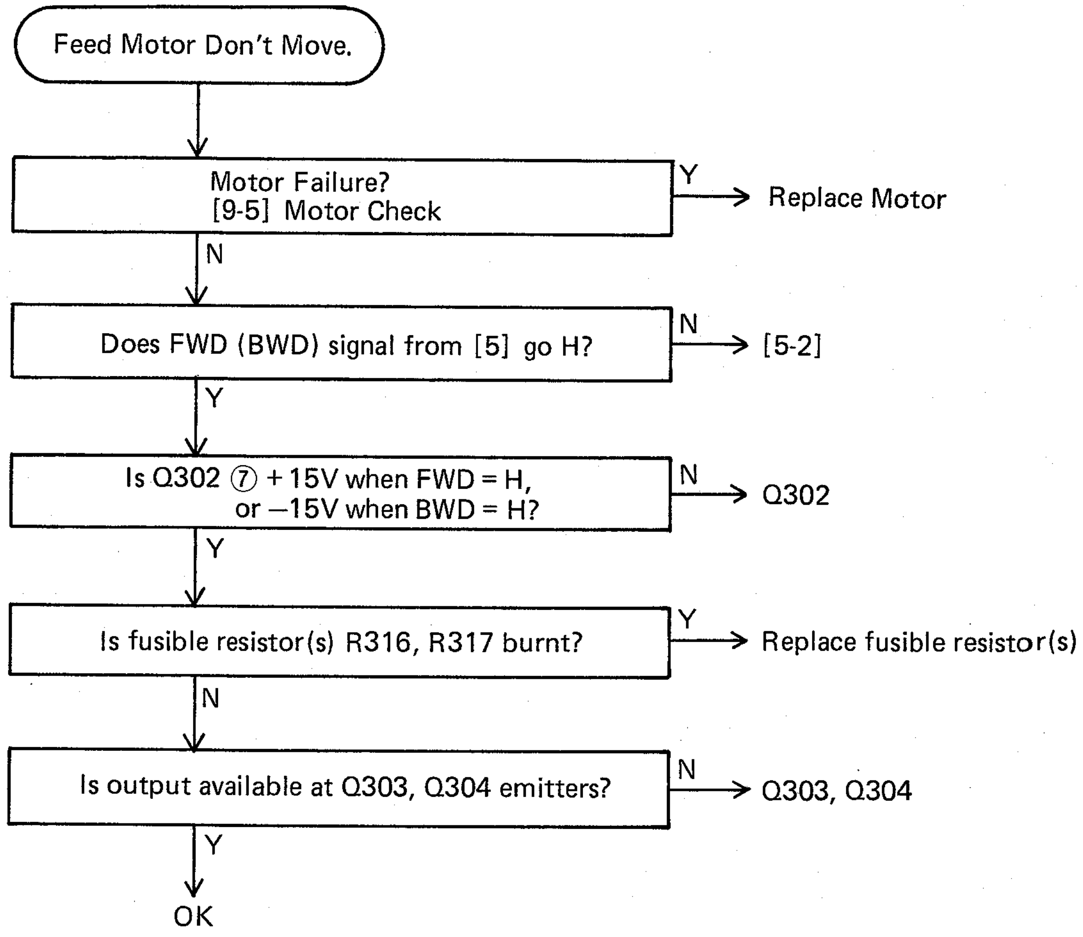

Is pulse generated at ③ of J-21, when SW is pushed?
N
[6] Q501 ㊱ (See Page 47)
or [6-4] (See Page 46)
Y
Q404 etc.

[9-3]


No PLAY
Is tracking servo good?
N
[1-1] (See Page 27)
Y
Is voltage at Q302 ⑭ –15V in PLAY mode?
N
PLAY signal is no good. → [5] Q402 ⑮
Q302
Y
Q301

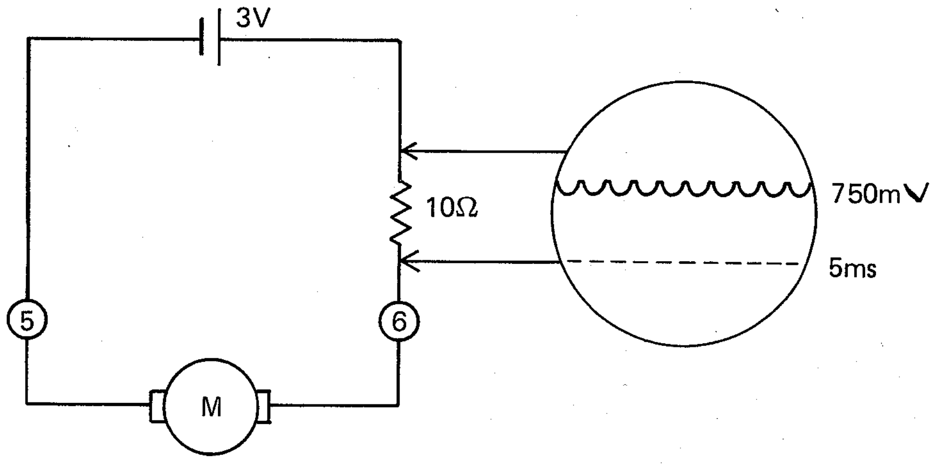
Note: FWD/BWD signals are not changed if FF/REV SW is pushed.

[9-4]


Feed Motor Don't Move.
Motor Failure?
[9-5] Motor Check
Y
Replace Motor
N
Does FWD (BWD) signal from [5] go H?
N
[5-2]
Y
Is Q302 ⑦ + 15V when FWD = H,
or –15V when BWD = H?
N
Q302
Y
Is fusible resistor(s) R316, R317 burnt?
Y
Replace fusible resistor(s)
N
Is output available at Q303, Q304 emitters?
N
Q303, Q304
Y
OK

[9-5] Motor Check

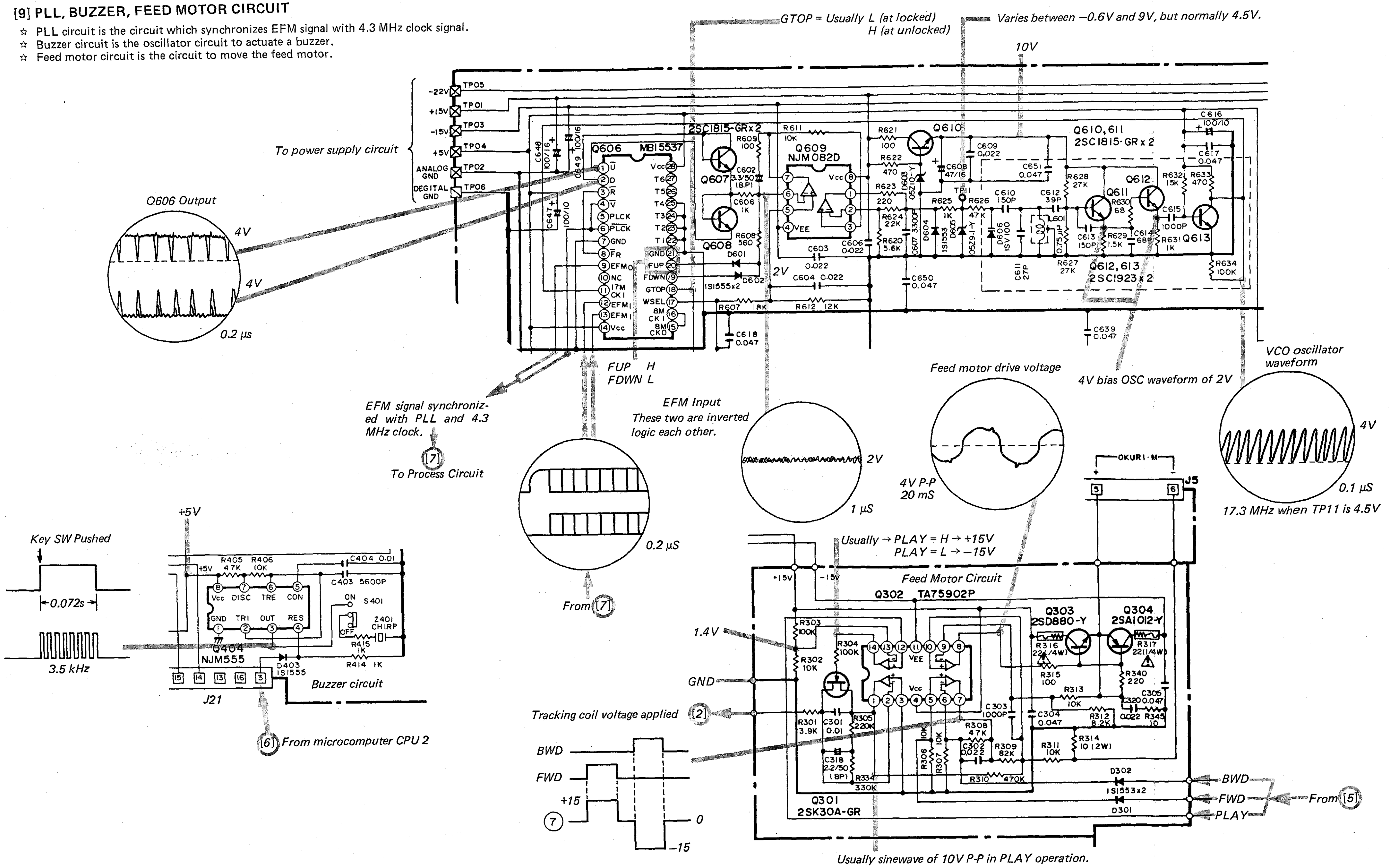
Temporarily disconnect ⑤, ⑥ of J-3 on Mecha. P.C. Board, and apply a regulated voltage to rotate the motor as shown below.


3V
10Ω
750mV
5ms
⑤
⑥
M

Feed Motor

[9] PLL, BUZZER, FEED MOTOR CIRCUIT

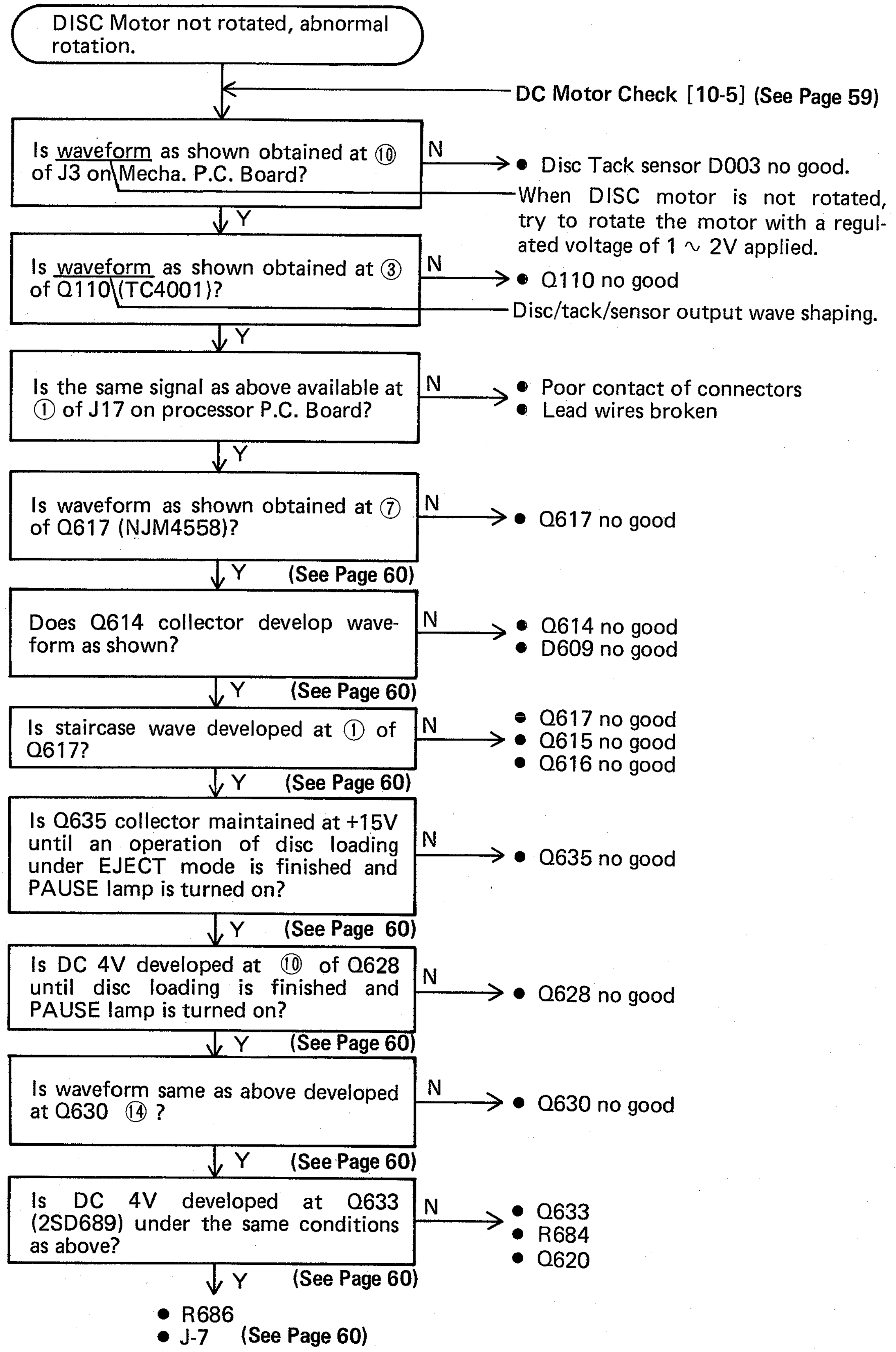
☆ PLL circuit is the circuit which synchronizes EFM signal with 4.3 MHz clock signal.
☆ Buzzer circuit is the oscillator circuit to actuate a buzzer.
☆ Feed motor circuit is the circuit to move the feed motor.



GTOP = Usually L (at locked)
H (at unlocked)
Varies between –0.6V and 9V, but normally 4.5V.
10V
To power supply circuit
-22V TP05
+15V TP01
-15V TP03
+5V TP04
ANALOG GND TP02
DEGITAL GND TP06
Q606 Output
4V
4V
0.2 µs
Q606 MB15537
①U ②D ③R ④V ⑤PLCK ⑥PLCK ⑦GND ⑧FR ⑨EFMO ⑩NC ⑪17M CK I ⑫EFM I ⑬EFM I ⑭Vcc
Vcc㉘ T6㉗ T5㉖ T4㉕ T3㉔ T2㉓ T1㉒ GND㉑ FUP⑳ FDWN⑲ GTOP⑱ WSEL⑰ 8M CK I⑯ 8M CKO⑮
2SC1815-GR x 2
Q607
Q608
Q609 NJM082D
Q610
Q610, 611 2SC1815·GR x 2
Q611
Q612
Q613
Q612, 613 2SC1923 x 2
1S1555 x 2
D601
D602
TP11
L601
C648 100/16
C649 100/16
C647 100/10
C602 3.3/50 (B.P)
C603 0.022
C604 0.022
C606 0.022
C608 47/16
C609 0.022
C610 150P
C612 39P
C613 150P
C614 68P
C615 1000P
C616 100/10
C617 0.047
C618 0.047
C639 0.047
C650 0.047
C651 0.047
R607 18K
R608 560
R609 100
R611 10K
R612 12K
R621 100
R622 470
R623
R624 22K
R620 5.6K
R625 1K
R626 47K
R627 27K
R628 27K
R629 1.5K
R630 68
R631 1K
R632 15K
R633 470
R634 100K
2V
EFM signal synchronized with PLL and 4.3 MHz clock.
[7] To Process Circuit
FUP H
FDWN L
EFM Input
These two are inverted logic each other.
0.2 µS
From [7]
2V
1 µS
Feed motor drive voltage
4V P-P
20 mS
4V bias OSC waveform of 2V
VCO oscillator waveform
4V
0.1 µS
17.3 MHz when TP11 is 4.5V
OKURI·M
J5
Key SW Pushed
0.072s
3.5 kHz
+5V
R405 47K
R406 10K
C404 0.01
C403 5600P
S401 ON OFF
Z401 CHIRP
R415 1K
R414 1K
Vcc DISC TRE CON
GND TRI OUT RES
Q404 NJM555
D403 1S1555
J21
Buzzer circuit
[6] From microcomputer CPU 2
Usually → PLAY = H → +15V
PLAY = L → –15V
+15V
-15V
Feed Motor Circuit
Q302 TA75902P
Q303 2SD880-Y
Q304 2SA1012-Y
1.4V
GND
Tracking coil voltage applied [2]
Q301 2SK30A-GR
R301 3.9K
R302 10K
R303 100K
R304 100K
R305 220K
R306 10K
R307 10K
R308 47K
R309 82K
R310 470K
R311 10K
R312 8.2K
R313 10K
R314 10 (2W)
R315 100
R316 22 (1/4W)
R317 22 (1/4W)
R334 330K
R340 220
R345 10
C301 0.01
C302 0.022
C303 1000P
C304 0.047
C305 0.047
C318 2.2/50 (BP)
C320 0.022
D301
D302
1S1553 x 2
BWD
FWD
PLAY
From [5]
BWD
FWD
+15
0
-15
⑦
Usually sinewave of 10V P-P in PLAY operation.

[10] CLV CIRCUIT

[10-1]



DISC Motor not rotated, abnormal rotation.

DC Motor Check [10-5] **(See Page 59)**

Is waveform as shown obtained at ⑩ of J3 on Mecha. P.C. Board? — N → • Disc Tack sensor D003 no good.
When DISC motor is not rotated, try to rotate the motor with a regulated voltage of 1 ∼ 2V applied.

Y

Is waveform as shown obtained at ③ of Q110 (TC4001)? — N → • Q110 no good
Disc/tack/sensor output wave shaping.

Y

Is the same signal as above available at ① of J17 on processor P.C. Board? — N →
- Poor contact of connectors
- Lead wires broken

Y

Is waveform as shown obtained at ⑦ of Q617 (NJM4558)? — N → • Q617 no good

Y **(See Page 60)**

Does Q614 collector develop waveform as shown? — N →
- Q614 no good
- D609 no good

Y **(See Page 60)**

Is staircase wave developed at ① of Q617? — N →
- Q617 no good
- Q615 no good
- Q616 no good

Y **(See Page 60)**

Is Q635 collector maintained at +15V until an operation of disc loading under EJECT mode is finished and PAUSE lamp is turned on? — N → • Q635 no good

Y **(See Page 60)**

Is DC 4V developed at ⑩ of Q628 until disc loading is finished and PAUSE lamp is turned on? — N → • Q628 no good

Y **(See Page 60)**

Is waveform same as above developed at Q630 ⑭ ? — N → • Q630 no good

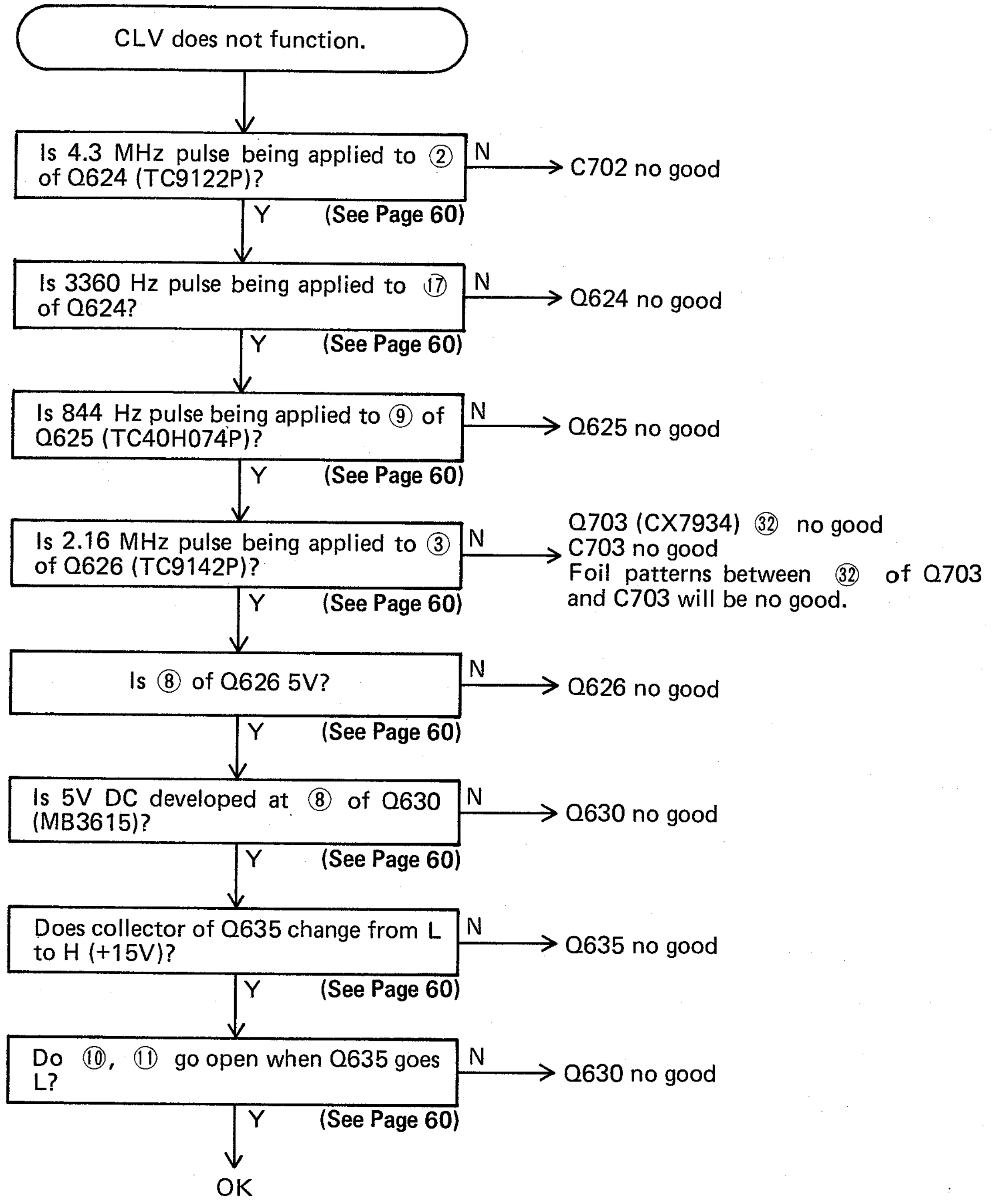
Y **(See Page 60)**

Is DC 4V developed at Q633 (2SD689) under the same conditions as above? — N →
- Q633
- R684
- Q620

Y **(See Page 60)**

- R686
- J-7 **(See Page 60)**

[10-2]



CLV does not function.

Is 4.3 MHz pulse being applied to ② of Q624 (TC9122P)? — N → C702 no good

Y **(See Page 60)**

Is 3360 Hz pulse being applied to ⑰ of Q624? — N → Q624 no good

Y **(See Page 60)**

Is 844 Hz pulse being applied to ⑨ of Q625 (TC40H074P)? — N → Q625 no good

Y **(See Page 60)**

Is 2.16 MHz pulse being applied to ③ of Q626 (TC9142P)? — N →
Q703 (CX7934) ㉜ no good
C703 no good
Foil patterns between ㉜ of Q703 and C703 will be no good.

Y **(See Page 60)**

Is ⑧ of Q626 5V? — N → Q626 no good

Y **(See Page 60)**

Is 5V DC developed at ⑧ of Q630 (MB3615)? — N → Q630 no good

Y **(See Page 60)**

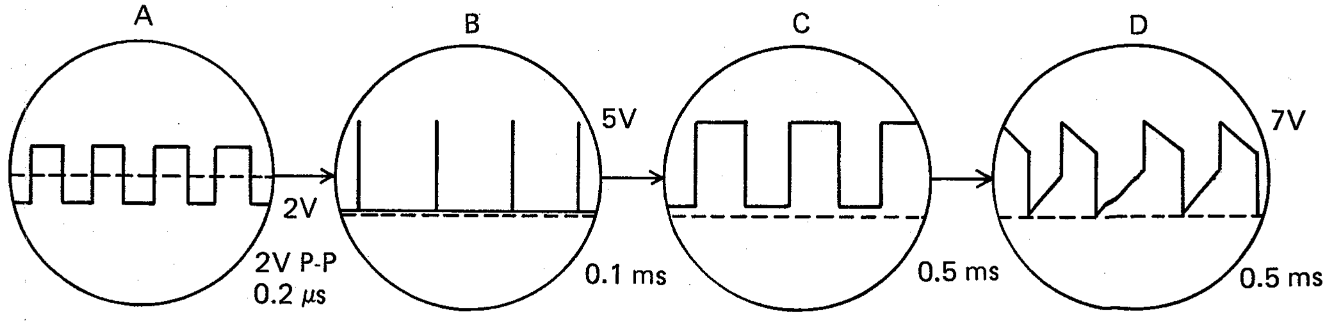
Does collector of Q635 change from L to H (+15V)? — N → Q635 no good

Y **(See Page 60)**

Do ⑩, ⑪ go open when Q635 goes L? — N → Q630 no good

Y **(See Page 60)**

OK



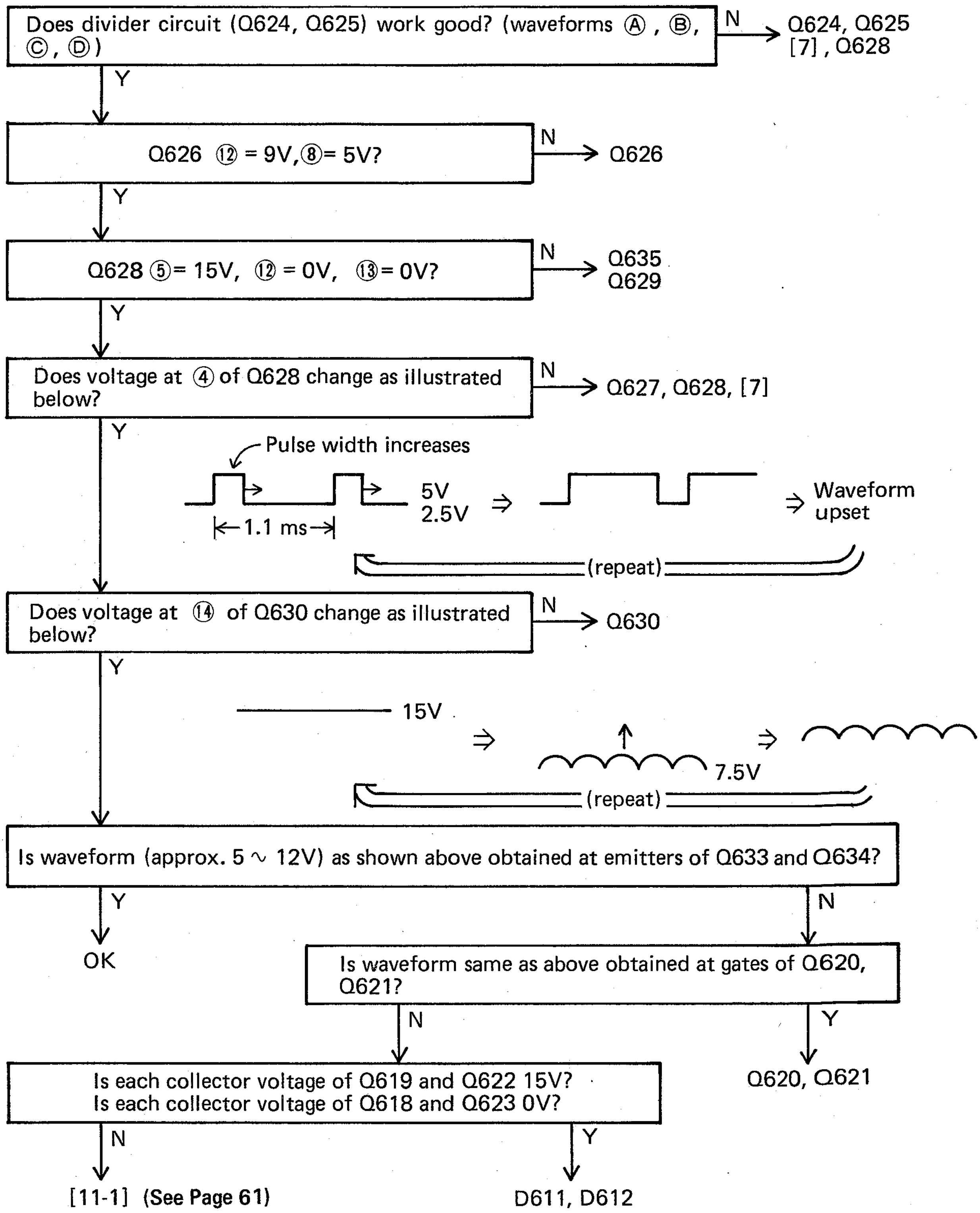
TC9122P ②
4.3 MHz

TC9122P ⑰

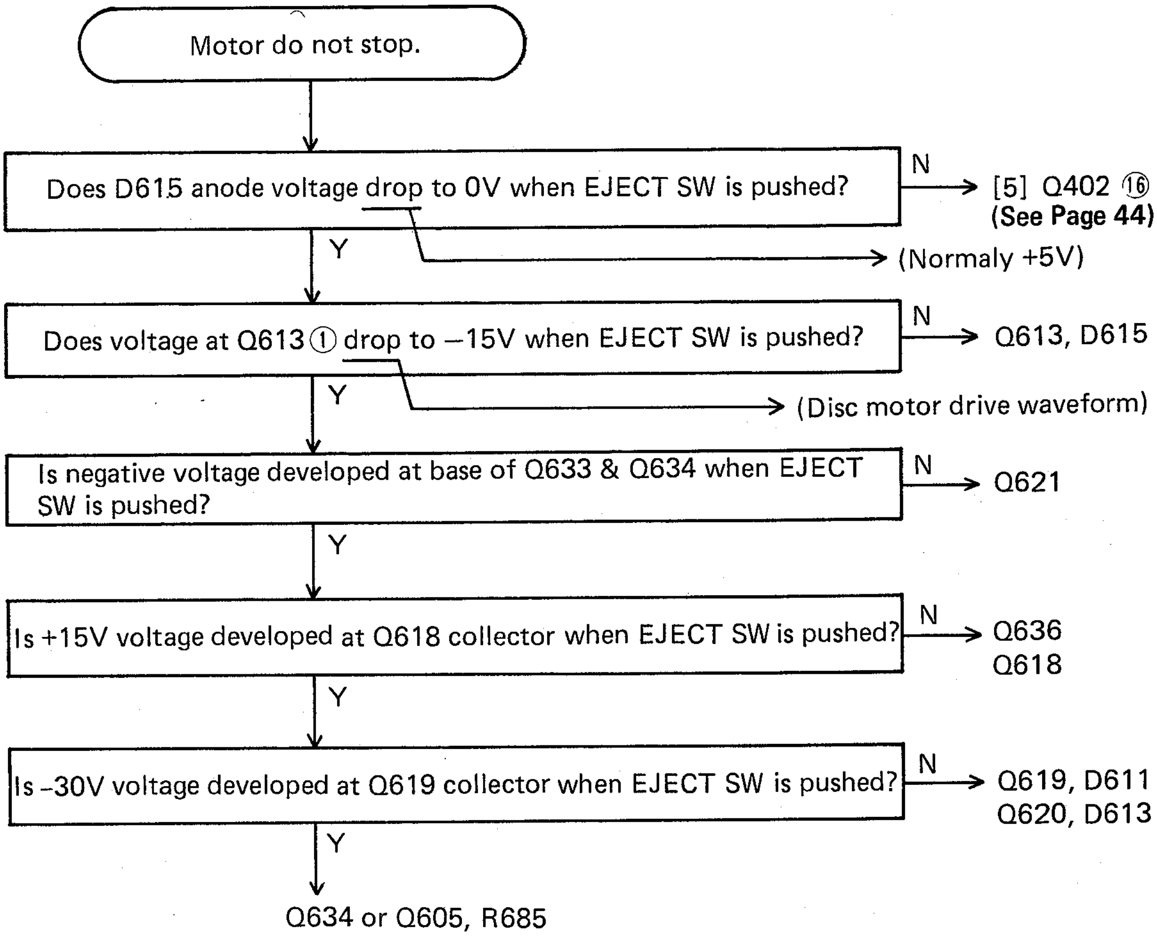
TC40H074P ⑨
844 Hz

TC9142P ⑥

[10-3] CHECK USING ENCODER

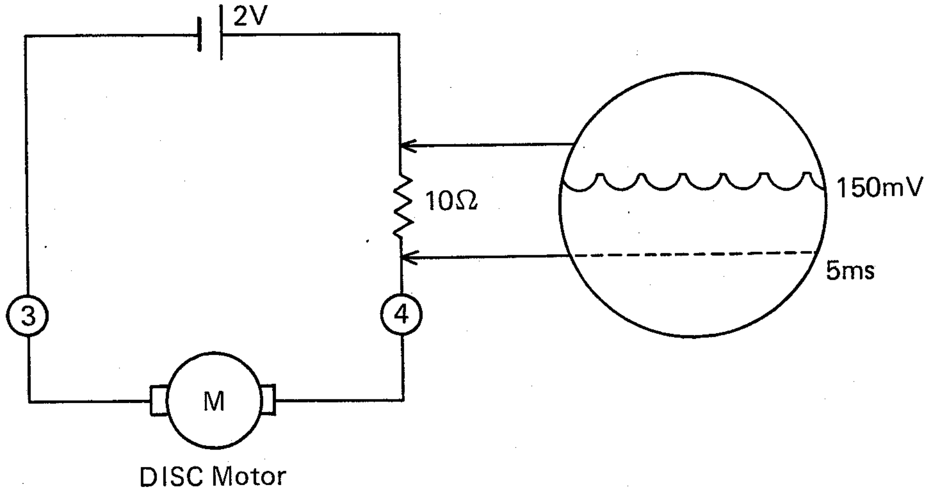

Does divider circuit (Q624, Q625) work good? (waveforms Ⓐ, Ⓑ, Ⓒ, Ⓓ)
N
Q624, Q625 [7], Q628
Y
Q626 ⑫ = 9V, ⑧ = 5V?
N
Q626
Y
Q628 ⑤ = 15V, ⑫ = 0V, ⑬ = 0V?
N
Q635 Q629
Y
Does voltage at ④ of Q628 change as illustrated below?
N
Q627, Q628, [7]
Y
Pulse width increases
5V
2.5V
1.1 ms
Waveform upset
(repeat)
Does voltage at ⑭ of Q630 change as illustrated below?
N
Q630
Y
15V
7.5V
(repeat)
Is waveform (approx. 5 ∿ 12V) as shown above obtained at emitters of Q633 and Q634?
Y
OK
N
Is waveform same as above obtained at gates of Q620, Q621?
Y
Q620, Q621
N
Is each collector voltage of Q619 and Q622 15V?
Is each collector voltage of Q618 and Q623 0V?
N
[11-1] (See Page 61)
Y
D611, D612

[10-4]


Motor do not stop.
Does D615 anode voltage drop to 0V when EJECT SW is pushed?
N
[5] Q402 ⑯
(See Page 44)
Y
(Normaly +5V)
Does voltage at Q613 ① drop to −15V when EJECT SW is pushed?
N
Q613, D615
Y
(Disc motor drive waveform)
Is negative voltage developed at base of Q633 & Q634 when EJECT SW is pushed?
N
Q621
Y
Is +15V voltage developed at Q618 collector when EJECT SW is pushed?
N
Q636
Q618
Y
Is −30V voltage developed at Q619 collector when EJECT SW is pushed?
N
Q619, D611
Q620, D613
Y
Q634 or Q605, R685

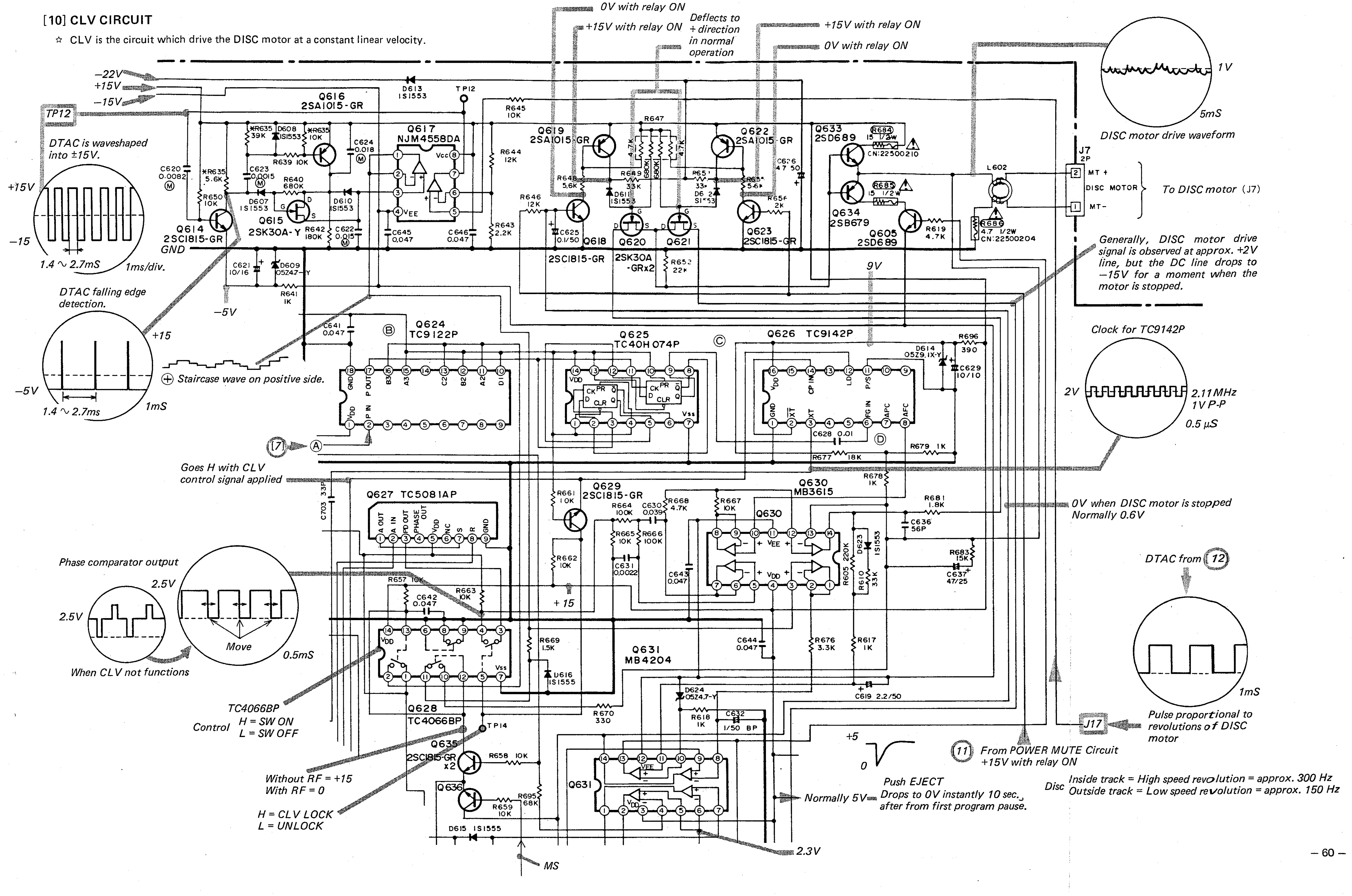
[10-5] Disc Motor Check

Temporally disconnect ③ & ④ of J-3 on Mechanical P.C. Board, and apply in regulated voltage to try to rotate the motor.


2V
10Ω
150mV
5ms
③
④
M
DISC Motor

[10] CLV CIRCUIT

☆ CLV is the circuit which drive the DISC motor at a constant linear velocity.



DTAC is waveshaped into ±15V.

DTAC falling edge detection.

⊕ Staircase wave on positive side.

Goes H with CLV control signal applied

Phase comparator output

When CLV not functions

Control H = SW ON L = SW OFF

Without RF = +15 With RF = 0

H = CLV LOCK L = UNLOCK

0V with relay ON

+15V with relay ON

Deflects to + direction in normal operation

+15V with relay ON

0V with relay ON

DISC motor drive waveform

To DISC motor (J7)

Generally, DISC motor drive signal is observed at approx. +2V line, but the DC line drops to −15V for a moment when the motor is stopped.

Clock for TC9142P

0V when DISC motor is stopped Normally 0.6V

DTAC from ⑫

Pulse proportional to revolutions of DISC motor

⑪ From POWER MUTE Circuit +15V with relay ON

Push EJECT Drops to 0V instantly 10 sec., after from first program pause.

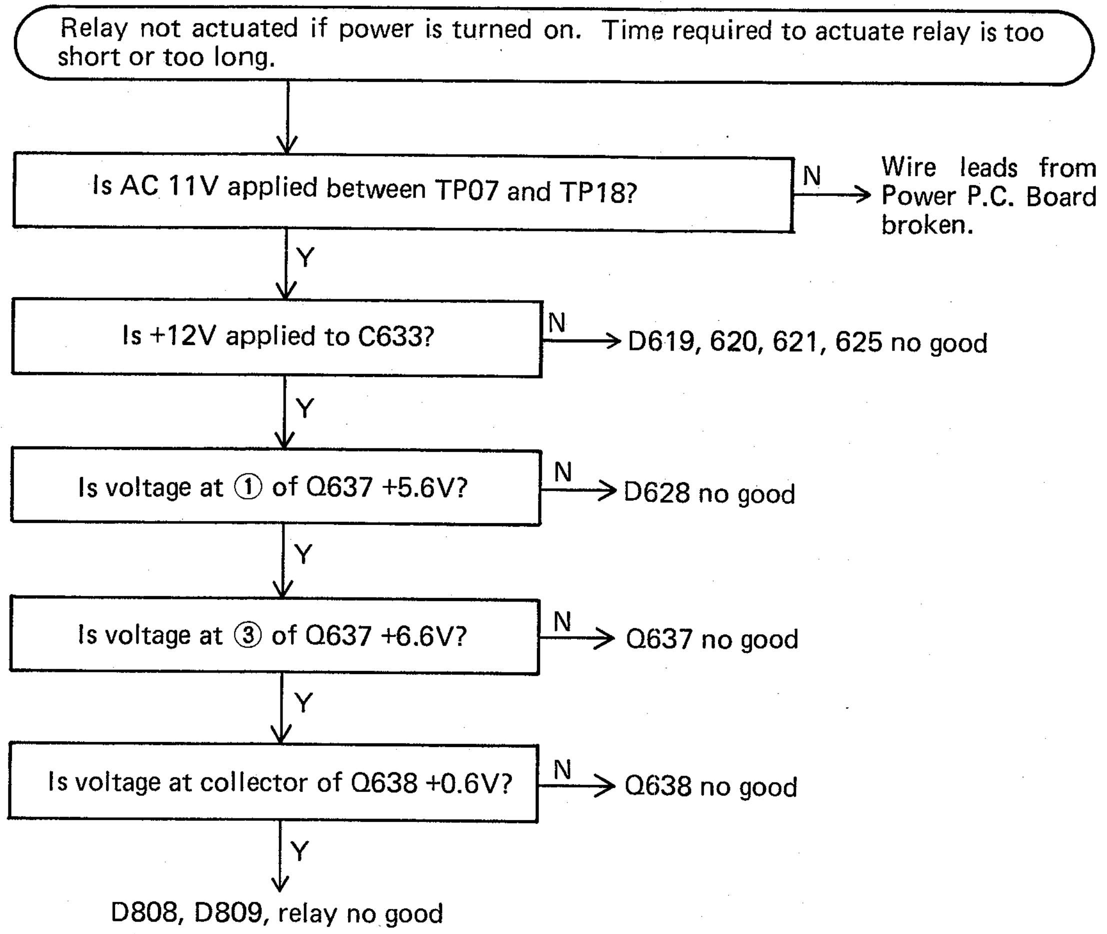
Normally 5V

Disc Inside track = High speed revolution = approx. 300 Hz Outside track = Low speed revolution = approx. 150 Hz

−22V
+15V
−15V
TP12
+15V
−15
1.4 ∼ 2.7mS
1ms/div.
+15
−5V
1.4 ∼ 2.7ms
1mS
−5V
GND
Q614 2SC1815-GR
Q615 2SK30A-Y
Q616 2SA1015-GR
Q617 NJM4558DA
Q618 2SC1815-GR
Q619 2SA1015-GR
Q620 Q621 2SK30A-GRx2
Q622 2SA1015-GR
Q623 2SC1815-GR
Q633 2SD689
Q634 2SB679
Q605 2SD689
Q624 TC9122P
Q625 TC40H074P
Q626 TC9142P
Q627 TC5081AP
Q628 TC4066BP
Q629 2SC1815-GR
Q630 MB3615
Q631 MB4204
Q635 2SC1815-GR x2
Q636
TC4066BP
D613 1S1553
TP12
TP14
R645 10K
R644 12K
R643 2.2K
R646 12K
R647
R648 5.6K
R649 33K
R651 33K
R652 22K
R653 5.6K
R656 2K
D611 1S1553
D612 S1553
C625 0.1/50
C626 47/50
R684 15 1/2W
R685 15 1/2W
R686 4.7 1/2W
CN:22500210
CN:22500204
R619 4.7K
L602
J7 2P
MT +
DISC MOTOR
MT −
1V
5mS
✱R635 39K
D608 1S1553
✱R635 10K
R639 10K
C623 0.0015
R640 680K
D607 1S1553
D610 1S1553
C620 0.0082
✱R635 5.6K
R650 10K
C624 0.018
R642 180K
C622 0.015
C645 0.047
C646 0.047
C621 10/16
D609 05Z4.7-Y
R641 1K
C641 0.047
Ⓑ Ⓒ Ⓓ
[7] Ⓐ
D614 05Z9.1X-Y
R696 390
C629 10/10
C628 0.01
R679 1K
R677 18K
R678 1K
9V
2V
2.11MHz
1V P-P
0.5 μS
C703 33P
R661 10K
R662 10K
R664 100K
C630 0.039
R665 10K
R666 100K
R668 4.7K
R667 10K
C631 0.0022
C643 0.047
R605 220K
D623 1S1553
R610 33K
R681 1.8K
C636 56P
R683 15K
C637 47/25
+15
2.5V
2.5V
Move
0.5mS
R657 10K
R663 10K
C642 0.047
R669 1.5K
D616 1S1555
C644 0.047
R676 3.3K
R617 1K
C619 2.2/50
D624 05Z4.7-Y
R618 1K
C632 1/50 BP
R670 330
R658 10K
R659 10K
R695 68K
D615 1S1555
MS
2.3V
+5
0
J17
1mS

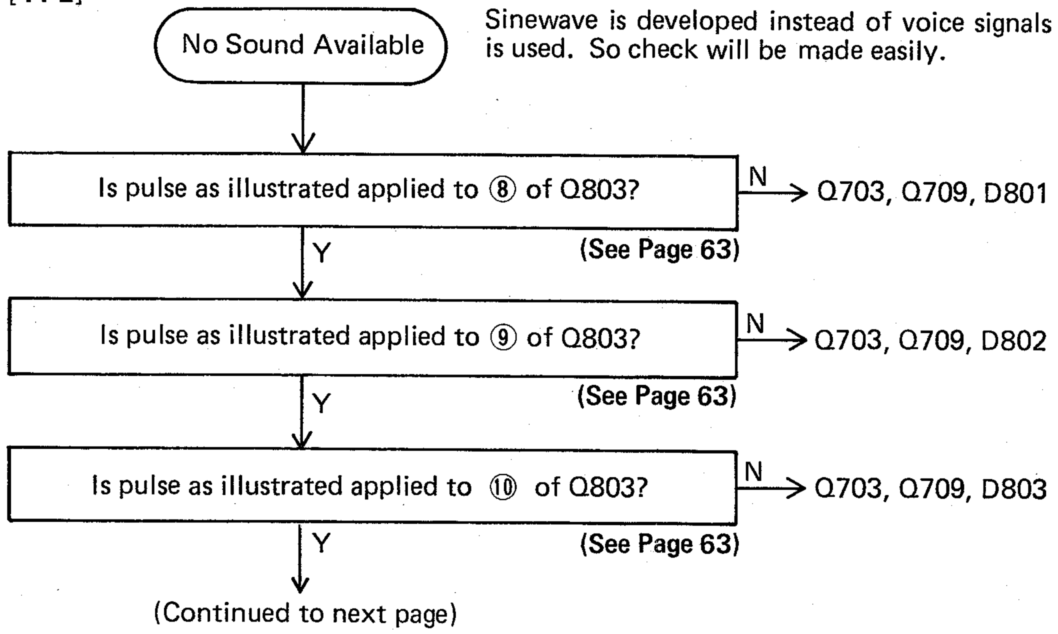
[11] DAC, POWER MUTE CIRCUIT

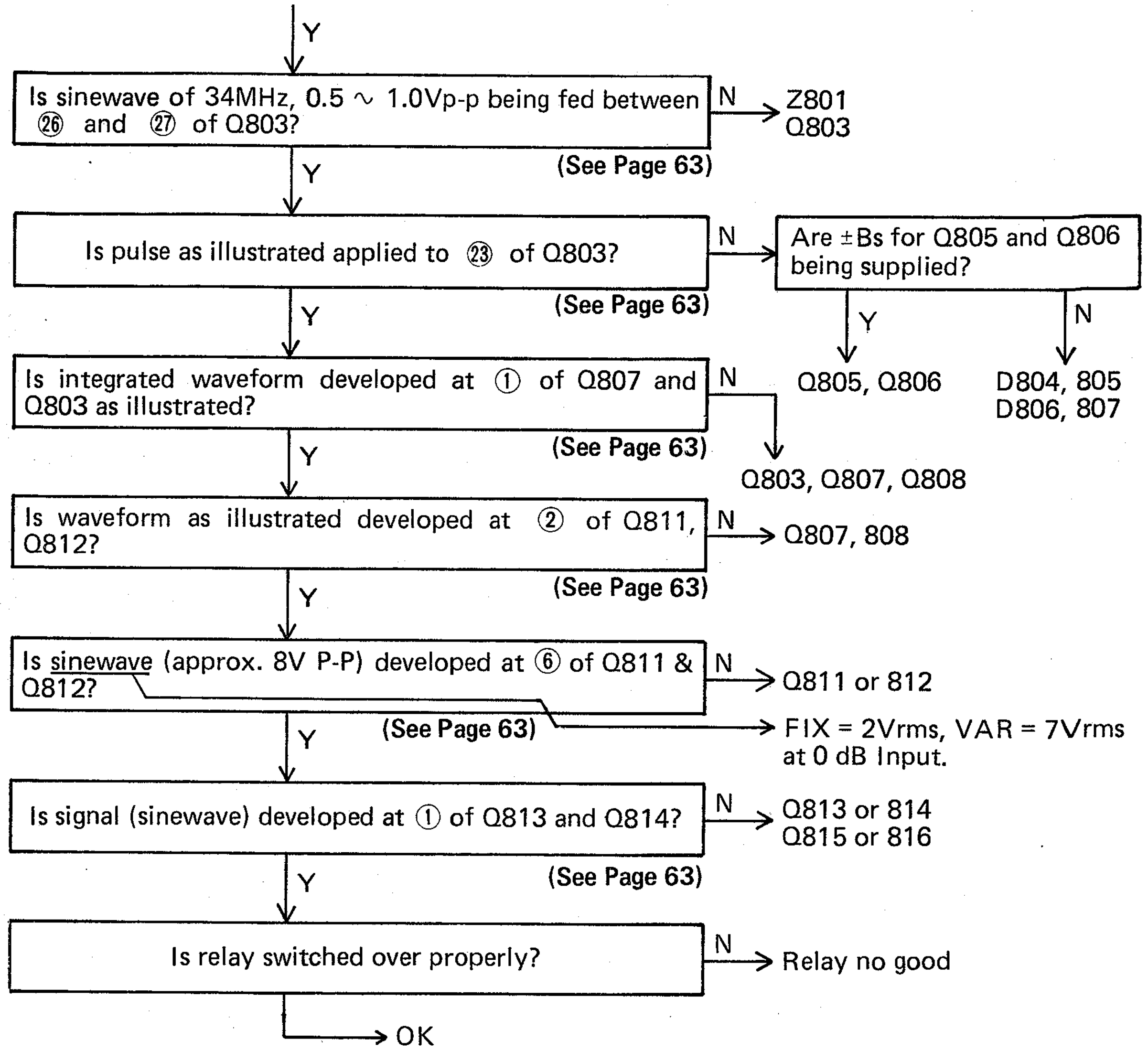
[11-1] Power Mute Circuit


Relay not actuated if power is turned on. Time required to actuate relay is too short or too long.
Is AC 11V applied between TP07 and TP18?
N
Wire leads from Power P.C. Board broken.
Y
Is +12V applied to C633?
N
D619, 620, 621, 625 no good
Y
Is voltage at ① of Q637 +5.6V?
N
D628 no good
Y
Is voltage at ③ of Q637 +6.6V?
N
Q637 no good
Y
Is voltage at collector of Q638 +0.6V?
N
Q638 no good
Y
D808, D809, relay no good

[11-2]

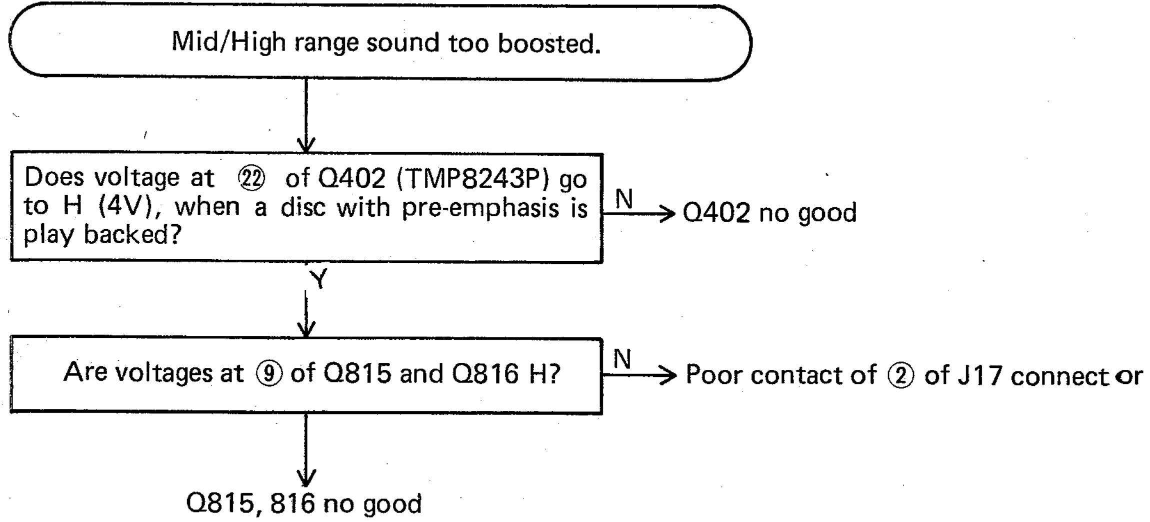
Sinewave is developed instead of voice signals if encoder is used. So check will be made easily.


No Sound Available
Is pulse as illustrated applied to ⑧ of Q803?
N
Q703, Q709, D801
Y
(See Page 63)
Is pulse as illustrated applied to ⑨ of Q803?
N
Q703, Q709, D802
Y
(See Page 63)
Is pulse as illustrated applied to ⑩ of Q803?
N
Q703, Q709, D803
Y
(See Page 63)
(Continued to next page)


Y
Is sinewave of 34MHz, 0.5 ∿ 1.0Vp-p being fed between ㉖ and ㉗ of Q803?
N
Z801
Q803
Y
(See Page 63)
Is pulse as illustrated applied to ㉓ of Q803?
N
Are ±Bs for Q805 and Q806 being supplied?
Y
Q805, Q806
N
D804, 805
D806, 807
Y
(See Page 63)
Is integrated waveform developed at ① of Q807 and Q803 as illustrated?
N
Q803, Q807, Q808
Y
(See Page 63)
Is waveform as illustrated developed at ② of Q811, Q812?
N
Q807, 808
Y
(See Page 63)
Is sinewave (approx. 8V P-P) developed at ⑥ of Q811 & Q812?
N
Q811 or 812
FIX = 2Vrms, VAR = 7Vrms at 0 dB Input.
Y
(See Page 63)
Is signal (sinewave) developed at ① of Q813 and Q814?
N
Q813 or 814
Q815 or 816
Y
(See Page 63)
Is relay switched over properly?
N
Relay no good
OK

Note: After replacement of parts in DAC section, make following measurements to confirm performances, using the encoder or an TEST DISC.

★ S/N (FIX)	Higher than 80 dB (approx. 85 dB) 90 dB with 30K LPF)	
★ Distortion (FIX)	Higher than 80 dB (approx. 85 dB)	
★ Crosstalk 1 KHz	Higher than 75 dB (approx. 80 dB)	

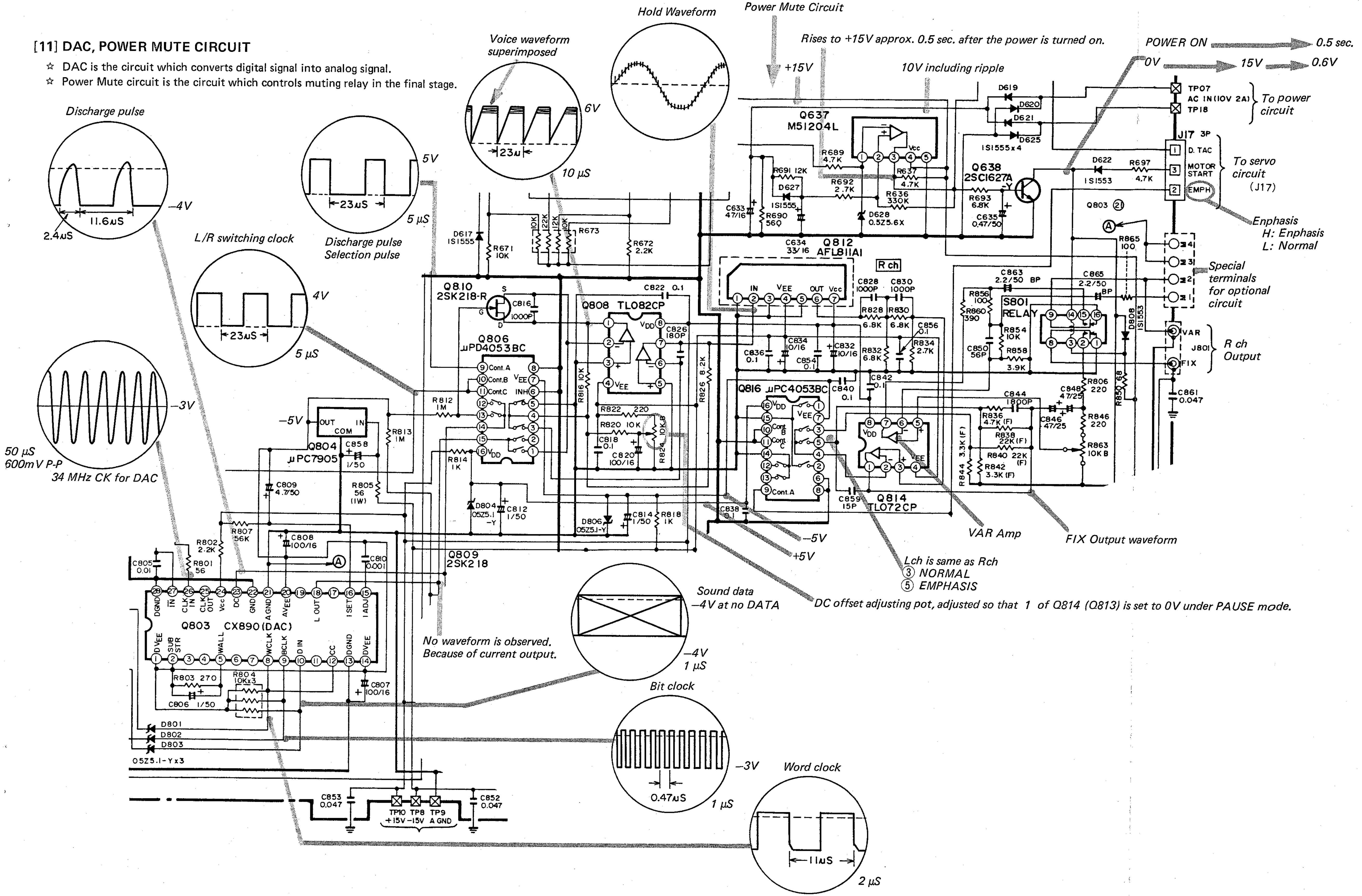

Mid/High range sound too boosted.
Does voltage at ㉒ of Q402 (TMP8243P) go to H (4V), when a disc with pre-emphasis is play backed?
N
Q402 no good
Y
Are voltages at ⑨ of Q815 and Q816 H?
N
Poor contact of ② of J17 connector
Q815, 816 no good

Other failures in tonal quality

When unit indicates poor S/N, distortion, crosstalk, etc, they will be preferably checked by measuring them with a test signal disc or an encoder.

[11] DAC, POWER MUTE CIRCUIT

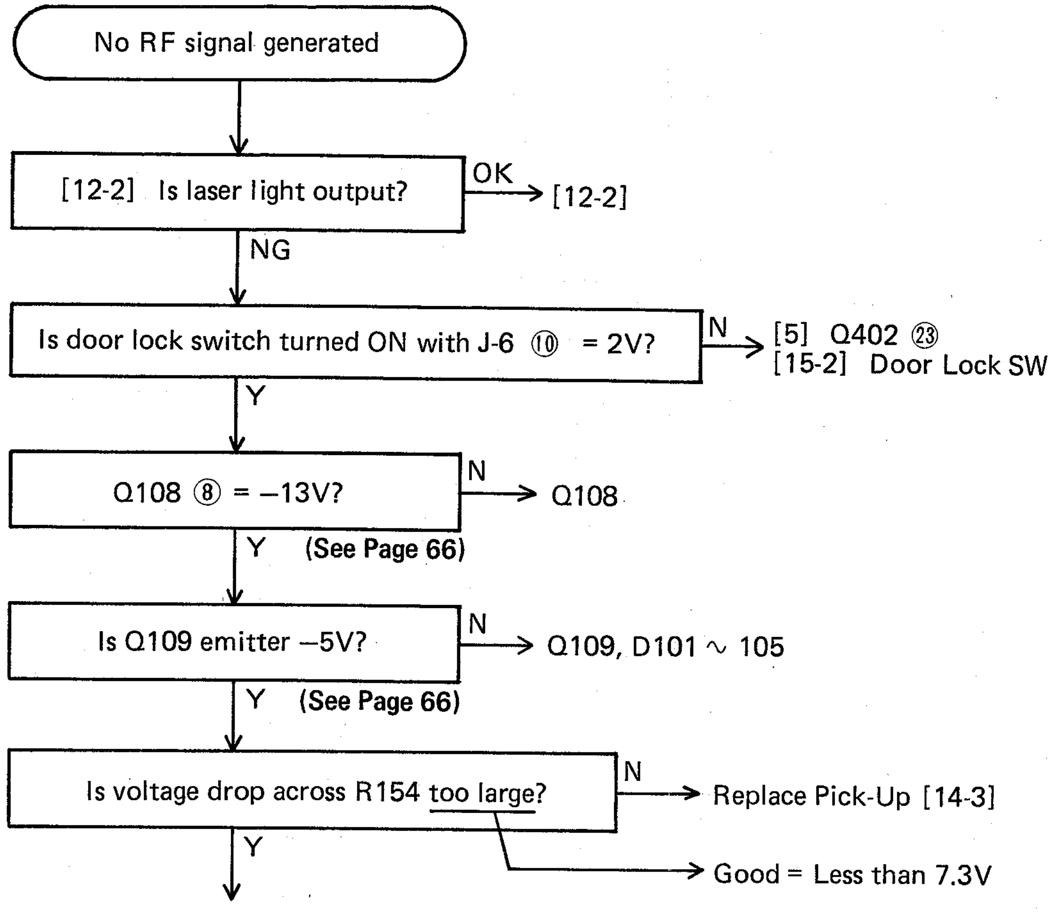
- ☆ DAC is the circuit which converts digital signal into analog signal.
- ☆ Power Mute circuit is the circuit which controls muting relay in the final stage.



Discharge pulse
2.4µS
11.6µS
-4V
Discharge pulse
Selection pulse
23µS
5V
5 µS
Voice waveform superimposed
6V
23µ
10 µS
Hold Waveform
Power Mute Circuit
+15V
Rises to +15V approx. 0.5 sec. after the power is turned on.
10V including ripple
POWER ON
0V
0.5 sec.
15V
0.6V
TP07
AC IN (10V 2A)
TP18
To power circuit
J17 3P
D. TAC
MOTOR START
EMPH
To servo circuit
(J17)
Enphasis
H: Enphasis
L: Normal
L/R switching clock
4V
23µS
5 µS
50 µS
600mV P-P
-3V
34 MHz CK for DAC
Q637
M51204L
Q638
2SC1627A-Y
Q812
AFL811A1
R ch
Q810
2SK218-R
Q806
µPD4053BC
Q808 TL082CP
Q816 µPC4053BC
Q814
TL072CP
S801
RELAY
Special terminals for optional circuit
J801
VAR
FIX
R ch Output
Q804
µPC7905
OUT
COM
IN
-5V
Q809
2SK218
Q803 CX890 (DAC)
DGND
IN
CLK IN
CLK OUT
Vcc
DC
GND
AGND
AVEE
L OUT
I SET
I ADJ
DVEE
SUB STR
WALL
WCLK
BCLK
D IN
CC
DGND
DVEE
D801
D802
D803
05Z5.1-Y x3
TP10 TP8 TP9
+15V -15V A GND
C853 0.047
C852 0.047
No waveform is observed. Because of current output.
Sound data
-4V at no DATA
-4V
1 µS
Bit clock
0.47µS
-3V
1 µS
Word clock
1 1µS
2 µS
-5V
+5V
VAR Amp
FIX Output waveform
Lch is same as Rch
③ NORMAL
⑤ EMPHASIS
DC offset adjusting pot, adjusted so that 1 of Q814 (Q813) is set to 0V under PAUSE mode.

[12] MECHANISM CONTROL CIRCUIT

[12-1]


No RF signal generated
[12-2] Is laser light output?
OK
[12-2]
NG
Is door lock switch turned ON with J-6 ⑩ = 2V?
N
[5] Q402 ㉓
[15-2] Door Lock SW
Y
Q108 ⑧ = –13V?
N
Q108
Y (See Page 66)
Is Q109 emitter –5V?
N
Q109, D101 ∿ 105
Y (See Page 66)
Is voltage drop across R154 too large?
N
Replace Pick-Up [14-3]
Y
Good = Less than 7.3V

Pick-Up may be deteriorated.
Replace pick-up if expected result is not obtained after realignment of the laser output. [14-3]

[12-2] How to check laser light output

To check the laser light output, a laser power checker is required. Use the laser power checker as specified and follow the procedures shown below.

Check Method

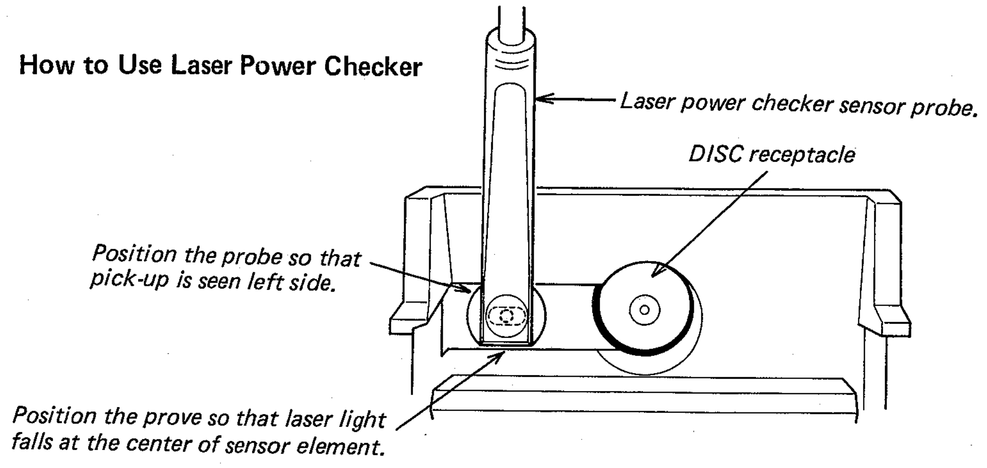
1) Disconnect only pin ⑩ of J-6, and connect ② to ground. (LASER ON condition).
2) Turn unit power ON with door opened and no disc loaded.
3) Insert the probe of the laser power checker so that the laser light falls at the center of laser light sensor on the probe as illustrated below. Next, push door lock switch (provided under B plunger on lower left of the mechanism) to create virtual door open condition.
4) Read indication on the laser power checker. If the output is less than 300 μW, adjust R153. Voltage across R154 should be less than 9.5V, if not replace the pick-up with new one.

Note 1. The laser light output has been fixed at 300 μW at shipment, however the output may decrease as the laser diode performance deteriorate.

Note 2. Current flowing into the laser diode is adjusted by R153, but do not rotate R153 excessively. If rotated excessively, possible laser diode breakdown may occured.

Note 3. There would be optical failures (ex. poor focusing, etc) even through the laser light output has been adjusted correctly.

How to Use Laser Power Checker

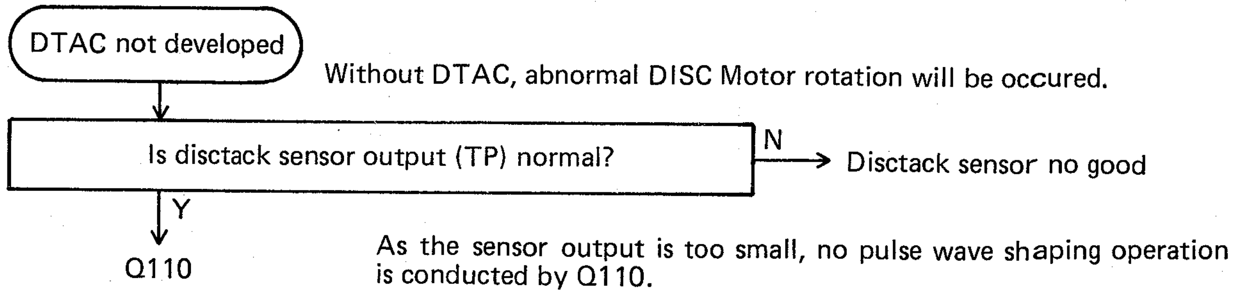

Laser power checker sensor probe.
DISC receptacle
Position the probe so that pick-up is seen left side.
Position the prove so that laser light falls at the center of sensor element.

Note: The laser power check will indicate incorrect values if the laser light does not fall at the center of sensor element. To make measurement more precisely, remove EJECT Cover and front panel, and insert the sensor from top of the mechanism.

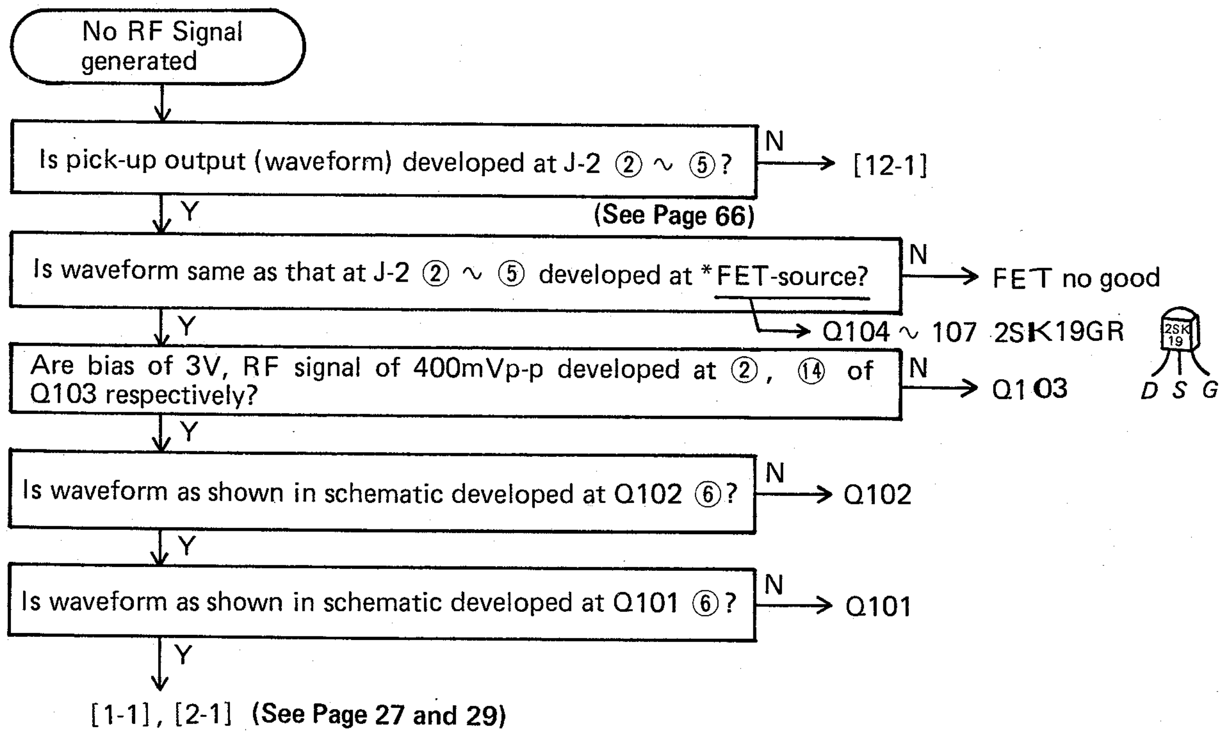
★ Recommendable specifications of Laser Power Checker

- ○ Wave length: 0.82μm
- ○ Light reception diameter: 8mm
- ○ Laser power checker using DPG, ML96A/MA912A manufactured by Anritsu Electronics.

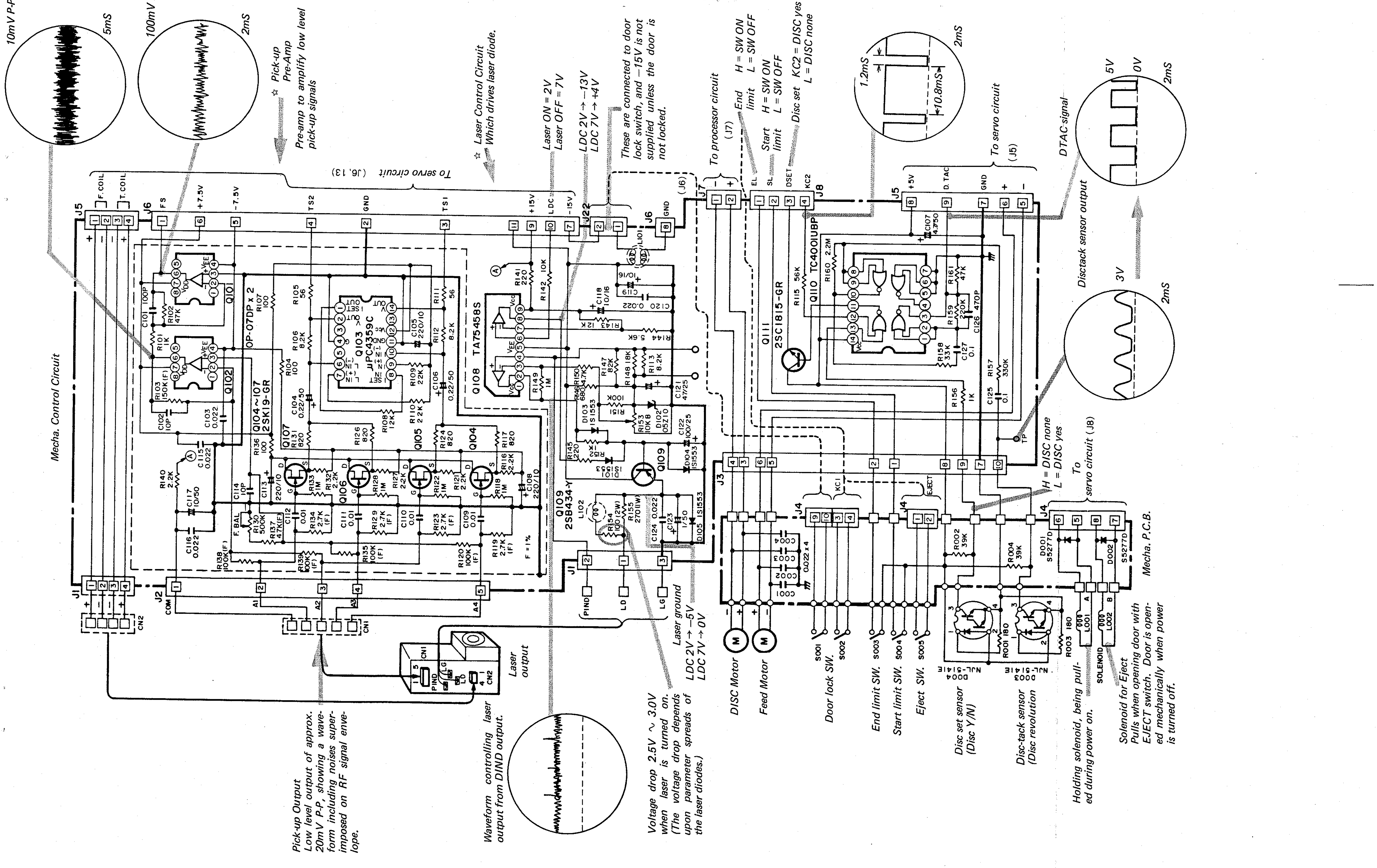
[12-3]


DTAC not developed
Without DTAC, abnormal DISC Motor rotation will be occured.
Is disctack sensor output (TP) normal?
N
Disctack sensor no good
Y
Q110
As the sensor output is too small, no pulse wave shaping operation is conducted by Q110.

[12-4] Pick-Up Pre-Amp


No RF Signal generated
Is pick-up output (waveform) developed at J-2 ② ∿ ⑤?
N
[12-1]
Y
(See Page 66)
Is waveform same as that at J-2 ② ∿ ⑤ developed at *FET-source?
N
FET no good
Y
Q104 ∿ 107 2SK19GR
2SK 19
D S G
Are bias of 3V, RF signal of 400mVp-p developed at ②, ⑭ of Q103 respectively?
N
Q103
Y
Is waveform as shown in schematic developed at Q102 ⑥?
N
Q102
Y
Is waveform as shown in schematic developed at Q101 ⑥?
N
Q101
Y
[1-1], [2-1] (See Page 27 and 29)

[12] MECHANISM CONTROL CIRCUIT


J5
F.COIL
T.COIL
J6
FS
+7.5V
-7.5V
TS2
GND
TS1
+15V
LDC
-15V
J22
J6
GND
(J6)
J7
EL
SL
DSET
KC2
J8
+5V
D.TAC
GND
Q101
Q102
OP-07DP x 2
Q103 μPC4359C
Q104~107 2SK19-GR
Q104
Q105
Q106
Q107
Q108 TA75458S
Q109 2SB434-Y
Q110 TC4001UBP
Q111 2SC1815-GR
D102 05Z10
D103 1S1553
D104 1S1553
D105 1S1553
L101
L102
R101 1K
R102 47K
R103 150K(F)
R104 100
R105 56
R106 8.2K
R107 100
R108 12K
R109 22K
R110 22K
R111 56
R112 8.2K
R113 8.2K
R115 56K
R116 2.2K
R117 820
R118 1M
R119 2.7K (F)
R120 100K (F)
R121 2.2K
R122 1M
R123 2.7K (F)
R124 820
R126 820
R127 2.2K
R128 1M
R129 2.7K (F)
R130 500K
R131 820
R132 2.2K
R133 1M
R134 2.7K (F)
R135 100K (F)
R136 100
R137 47K(F)
R138 100K(F)
R139 100K (F)
R140 2.2K
R141 220
R142 10K
R143 12K
R144 5.6K
R145 220
R146 680
R147 82K
R148 18K
R149 1M
R150 4.7K
R151 100K
R153 10KB
R154 100 (2W)
R155 270 (1W)
R156 1K
R157 330K
R158 33K
R159 220K
R160 2.2M
R161 47K
C101 100P
C102 10P
C103 0.022
C104 0.22/50
C105 220/10
C106 0.22/50
C107 4.7/50
C108 220/10
C109 0.01
C110 0.01
C111 0.01
C112 0.01
C113 220/10
C114 10P
C115 0.022
C116 0.022
C117 10/50
C118 10/16
C119 10/16
C120 0.022
C121 47/25
C122 100/25
C123 1/50
C124 0.022
C125 0.1
C126 470P
C127 0.1
F. BAL
F = 1%
TP
J1
J2
J3
J4
COM
A1
A2
A3
A4
CN1
CN2
PIND
LD
LG
KC1
EJECT
C001
C002
C003
C004
0.022 x 4
R002 39K
R004 39K
D001 S5277D
D002 S5277D
R001 180
R003 180
D003 NJL-5141E
D004 NJL-5141E
L001
L002
SOLENOID
S001
S002
S003
S004
S005
M

10mV P-P

5mS

100mV P-P

2mS

☆ Pick-up Pre-Amp

Pre-amp to amplify low level pick-up signals

☆ Laser Control Circuit Which drives laser diode.

To servo circuit (J6, 13)

Laser ON = 2V
Laser OFF = 7V

LDC 2V → -13V
LDC 7V → +4V

These are connected to door lock switch, and -15V is not supplied unless the door is not locked.

To processor circuit (J7)

End limit H = SW ON
L = SW OFF

Start limit H = SW ON
L = SW OFF

Disc set KC2 = DISC yes
L = DISC none

1.2mS

10.8mS

2mS

To servo circuit (J5)

DTAC signal

5V

0V

2mS

Disctack sensor output

3V

2mS

Mecha. Control Circuit

H = DISC none
L = DISC yes

To servo circuit (J8)

Mecha. P.C.B.

Laser output

Pick-up Output
Low level output of approx. 20mV P-P, showing a waveform including noises superimposed on RF signal envelope.

Waveform controlling laser output from DIND output.

Voltage drop 2.5V ~ 3.0V when laser is turned on. (The voltage drop depends upon parameter spreads of the laser diodes.)

Laser ground
LDC 2V → -5V
LDC 7V → 0V

DISC Motor

Feed Motor

Door lock SW.

End limit SW.

Start limit SW.

Eject SW.

Disc set sensor (Disc Y/N)

Disc-tack sensor (Disc revolution

Holding solenoid, being pulled during power on.

Solenoid for Eject
Pulls when opening door with EJECT switch. Door is opened mechanically when power is turned off.

[13] POWER SUPPLY CIRCUIT

[13-1] OUTLINE

The power supply circuit consists of an AC line filter, power transformer, and five separate rectification circuits which are followed by regulated voltage control circuits, respectively. For the output voltages, refer to below.

[13-2] CIRCUIT

[13-2-1] AC line filter

A line filter (L901) is provided between a terminal of an AC cord and a primary winding of the power transformer to remove undesirable noises from power lines and to suppress RF noises conduction to the power lines.

[13-2-2] Rectification circuit

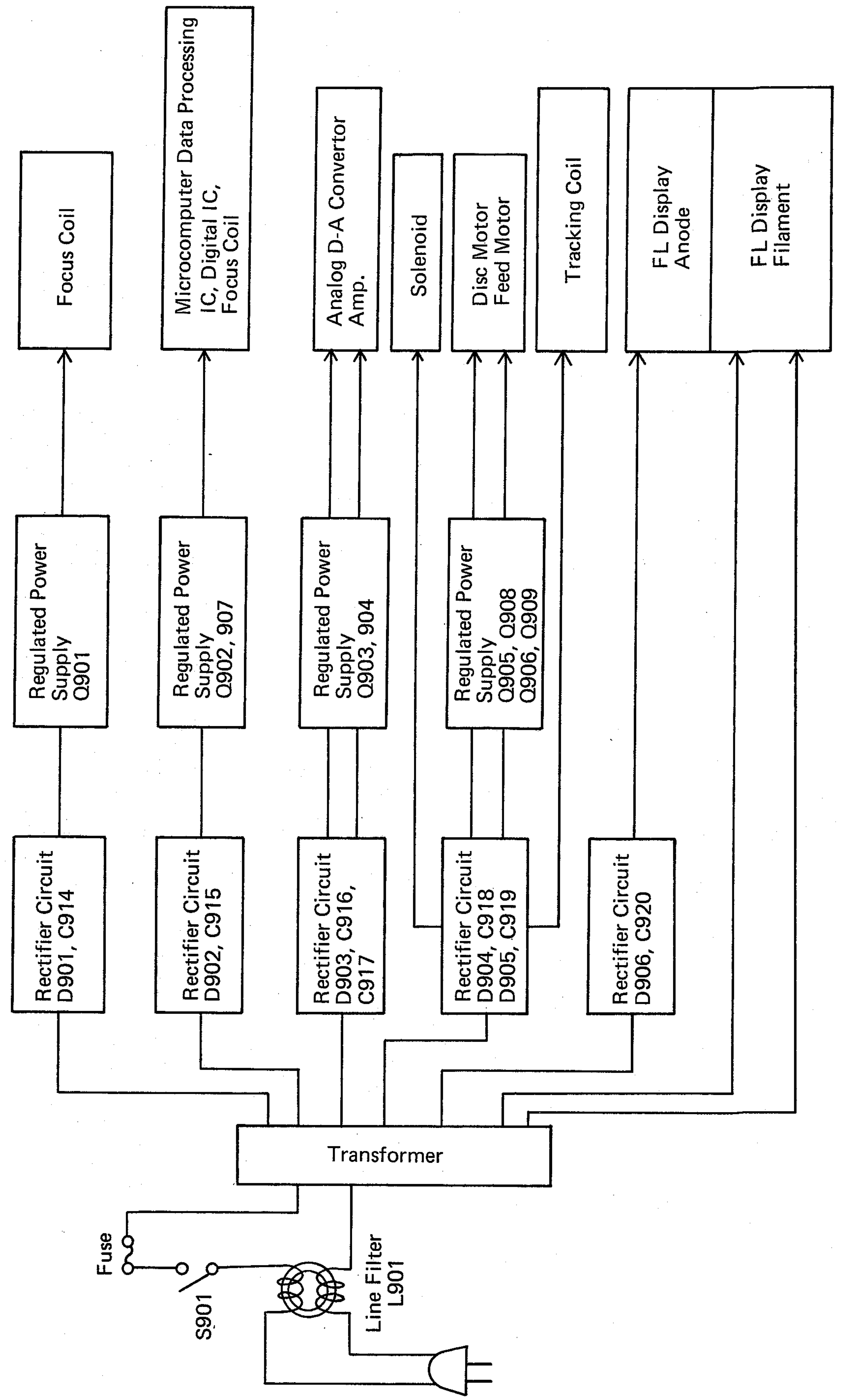
All five separate rectification circuits are of bridge type. One of feature to be noted is that one big capacitor having 33,000 μF/16V (C915) is employed in a rectification circuit which supplies its power to the microcomputer and data processing circuits to assure stable operation if power failure is occured or instanteneous voltage reduction is caused (if AC primary voltage is interrupted for a period of approx. 9 cycles or the voltage is dropped to approx. 75% of rated voltage).

[13-2-3] Regulated power supply

The regulated power supply section provides six kinds of line voltages regulated with ICs.

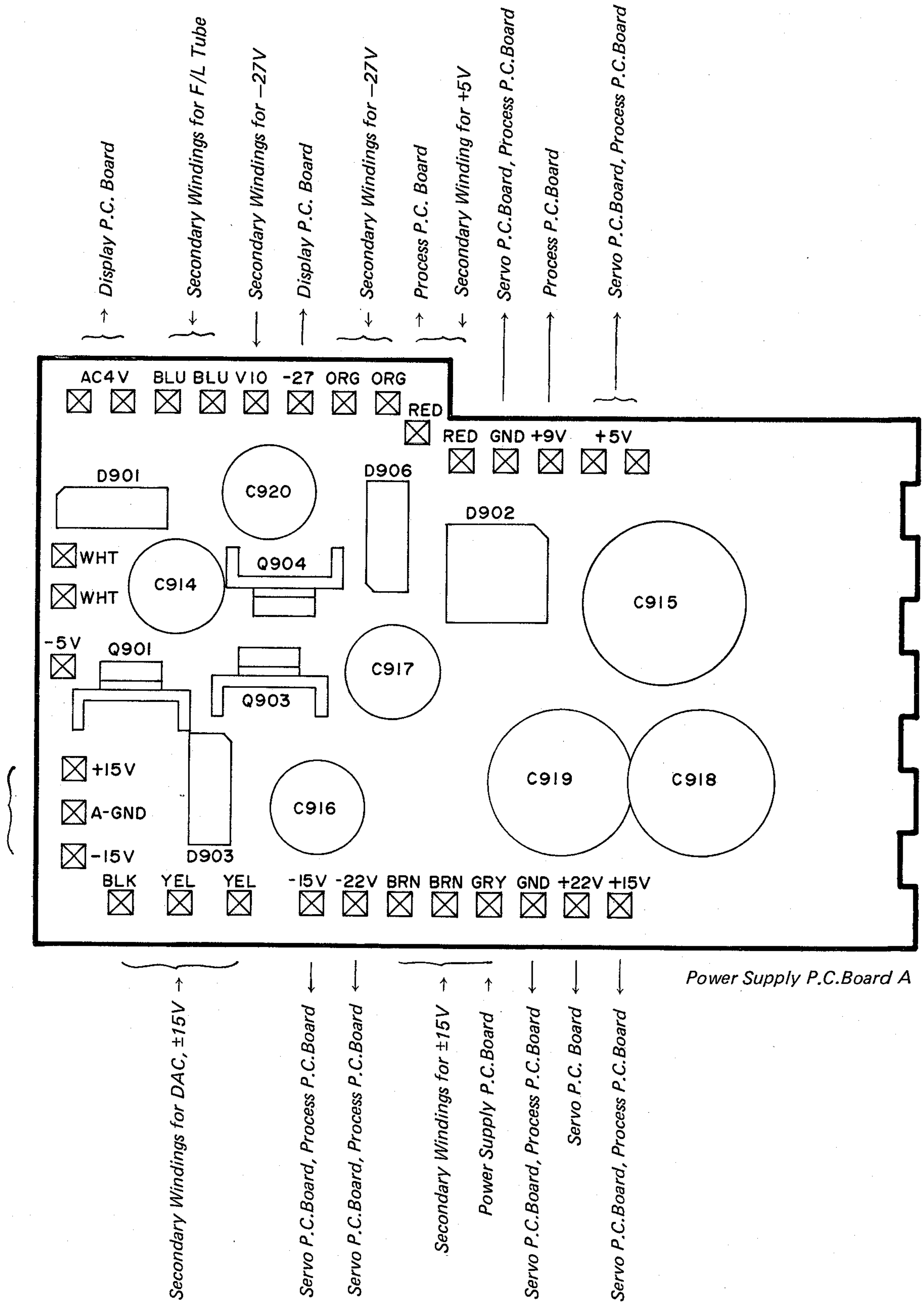
For analog amplifiers	±15V
For focus coil	−5V
For μ-computer, data processing ICs	+5V
For disc feed motor	±15V

Of the above six lines, booster systems using power transistors are provided in the +5V and ±15 power line circuits to allow sufficient power supply.


Focus Coil
Microcomputer Data Processing IC, Digital IC, Focus Coil
Analog D-A Convertor Amp.
Solenoid
Disc Motor Feed Motor
Tracking Coil
FL Display Anode
FL Display Filament
Regulated Power Supply Q901
Regulated Power Supply Q902, 907
Regulated Power Supply Q903, 904
Regulated Power Supply Q905, Q908 Q906, Q909
Rectifier Circuit D901, C914
Rectifier Circuit D902, C915
Rectifier Circuit D903, C916, C917
Rectifier Circuit D904, C918 D905, C919
Rectifier Circuit D906, C920
Transformer
Fuse
S901
Line Filter L901

Power Supply Block

[13-3] POWER SUPPLY P.C. BOARD PARTS LAYOUT


Display P.C. Board
Secondary Windings for F/L Tube
Secondary Windings for −27V
Display P.C. Board
Secondary Windings for −27V
Process P.C. Board
Secondary Winding for +5V
Servo P.C.Board, Process P.C.Board
Process P.C.Board
Servo P.C.Board, Process P.C.Board
AC4V
BLU
BLU
V10
-27
ORG
ORG
RED
RED
GND
+9V
+5V
D901
C920
D906
D902
WHT
WHT
C914
Q904
C915
-5V
Q901
C917
Q903
+15V
A-GND
-15V
C916
C919
C918
D903
BLK
YEL
YEL
-15V
-22V
BRN
BRN
GRY
GND
+22V
+15V
Secondary Windings for DAC, ±15V
Servo P.C.Board, Process P.C.Board
Servo P.C.Board, Process P.C.Board
Secondary Windings for ±15V
Power Supply P.C.Board
Servo P.C.Board, Process P.C.Board
Servo P.C. Board
Servo P.C.Board, Process P.C.Board

Power Supply P.C.Board A

[14] ELECTRICAL ALIGNMENT

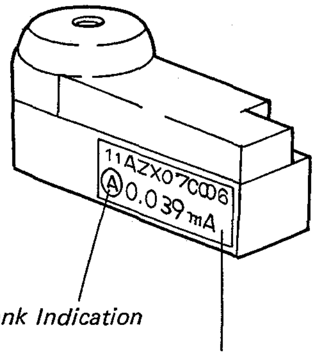
[14-1] REPLACEMENT & ALIGNMENT OF PICKUP

1. REPLACEMENT OF PICKUP

For details on removal of pickup and reinstallation, refer to pages 100 and 101.

2. RANKS OF PICKUP

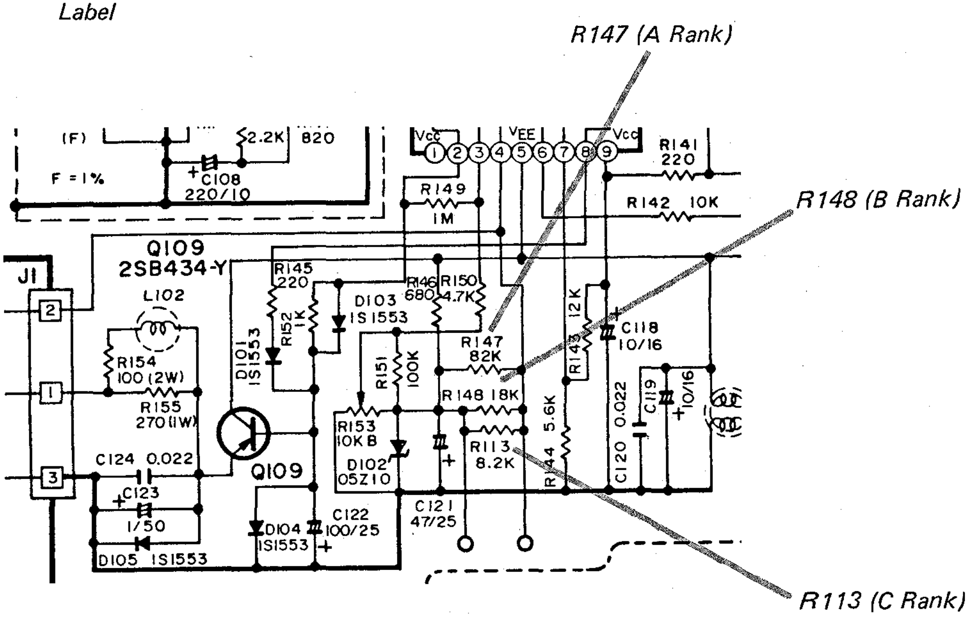
The pickups are divided into three rank groups, A, B, and C, and one of ranks is indicated on a label put on a side of the pickup as shown. When a new pickup having the same rank as one of the pickup to be replaced is replaced, no additional resistor replacement is required. However, when the pickup has a different rank, one resistor must be changed as tabulated below, depending on the rank of the pickup to be replaced.


11AZX07C006
Ⓐ0.039mA

Rank Indication

Label

Symbol No. / Rank	R147	R148	R113
A	Use 82KΩ	Deletion	Deletion
B	Deletion	Use 18KΩ	Deletion
C	Deletion	Deletion	Use 8.2KΩ


R147 (A Rank)
R148 (B Rank)
R113 (C Rank)
(F)
F = 1%
2.2K
820
C108
220/10
Q109
2SB434-Y
J1
L102
R154
100 (2W)
R155
270 (1W)
C124 0.022
C123
1/50
D105 1S1553
R145
220
R152
1K
D101
1S1553
D103
1S1553
R146
680
R150
4.7K
R151
100K
R153
10KB
D102
05Z10
D104
1S1553
C122
100/25
C121
47/25
R149
1M
R147
82K
R148 18K
R113
8.2K
R144 5.6K
R143
12K
Vcc
VEE
R141
220
R142 10K
C118
10/16
C119
C120 0.022
10/16

Mechanism Control Circuit

[14-2] ELECTRICAL ALIGNMENT

Mechanism P.C. Board

Item	Alignment Point	Measurement Point	Alignment Method
Laser Power Alignment	R153	Pickup actuator	Adjust to obtain light output of 300 μW.

Alignment Method

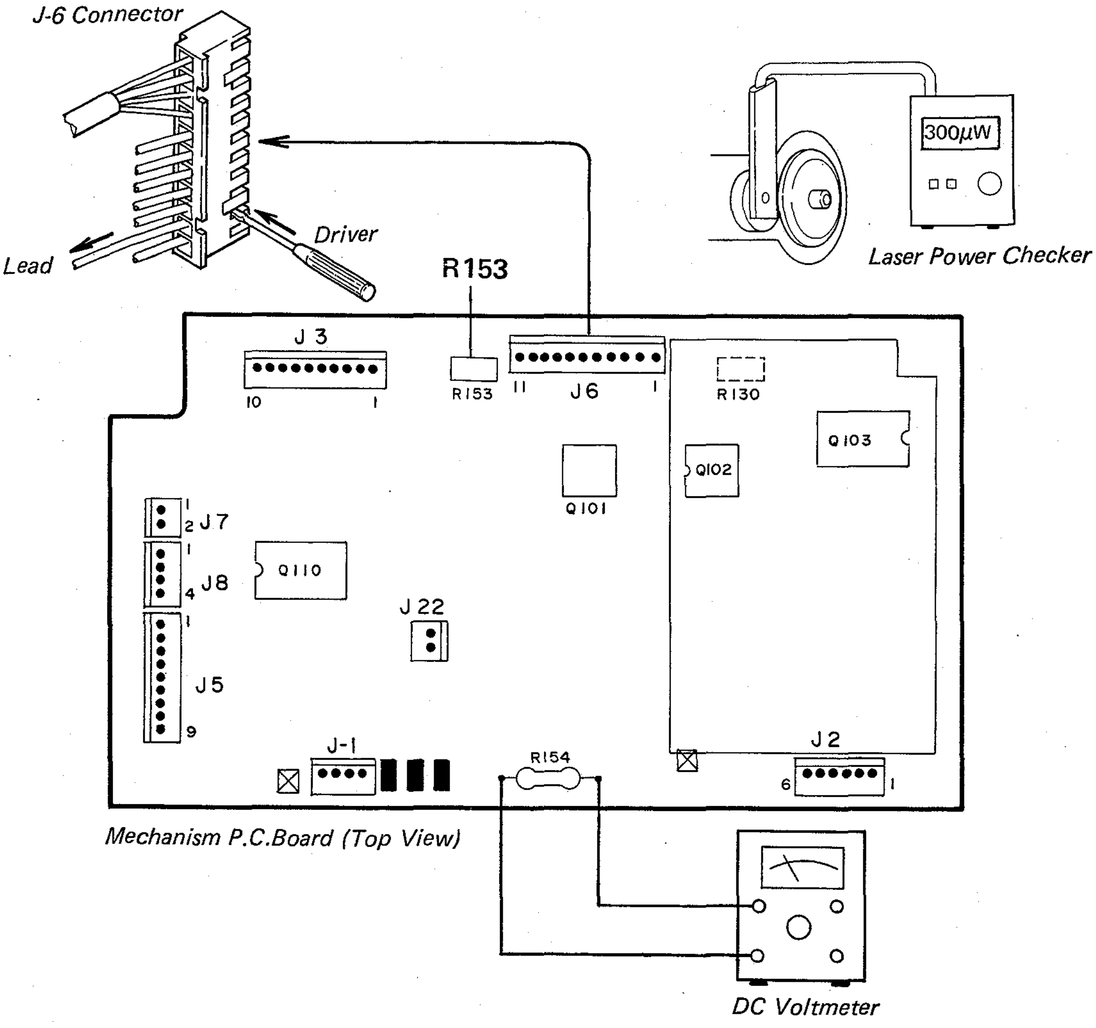
1. Disconnect only 10 of J-6, and connect it to ground. (Laser on condition)
2. Turn the power on with no disc loaded.
3. Apply laser power checker to actuator section of the pickup (as illustrated above) and close the door. If the door can not be closed completely, push door lock switch (a leaf switch provided left, lower corner of the Mecha. Chassis) to make the door close electrically.
4. Read laser power checker and adjust R153 to obtain 0.3mW output. Also, make sure the voltage across resistor R154 is less than 9.5V. If the voltage is higher than 9.5V replace the pickup.

Note: Don't turn the trim pot excessively, if turned so the laser diode may possibly damaged.

1. Removal of J-6 connector

Pull the cord while pressing hook section of J-6 (10) with a (–) screw driver, and lead wire at (10) will be removed.

When reinsert the lead to its original position, insert the lead while pulling the hook section slightly.


J-6 Connector
Lead
Driver
R153
300μW
Laser Power Checker
J 3
10
1
R153
11
J6
1
R130
Q103
Q102
Q101
1
2 J7
1
4 J8
Q110
1
J 22
J5
9
J-1
R154
J2
6
1
Mechanism P.C.Board (Top View)
DC Voltmeter

[14-3] PICKUP POSITION ALIGNMENT

Connection and Alignment Method

(1) Connect input circuit of the PU Alignment jig to emitter of transistor Q208 or Q209 on the Servo P.C. Board, and the output side of the jig to an oscilloscope.

(2) Connect an oscilloscope to TP4 on the Servo P.C. Borad.

(3) Connect a VTVM to TP5 on the Servo P.C. Board.

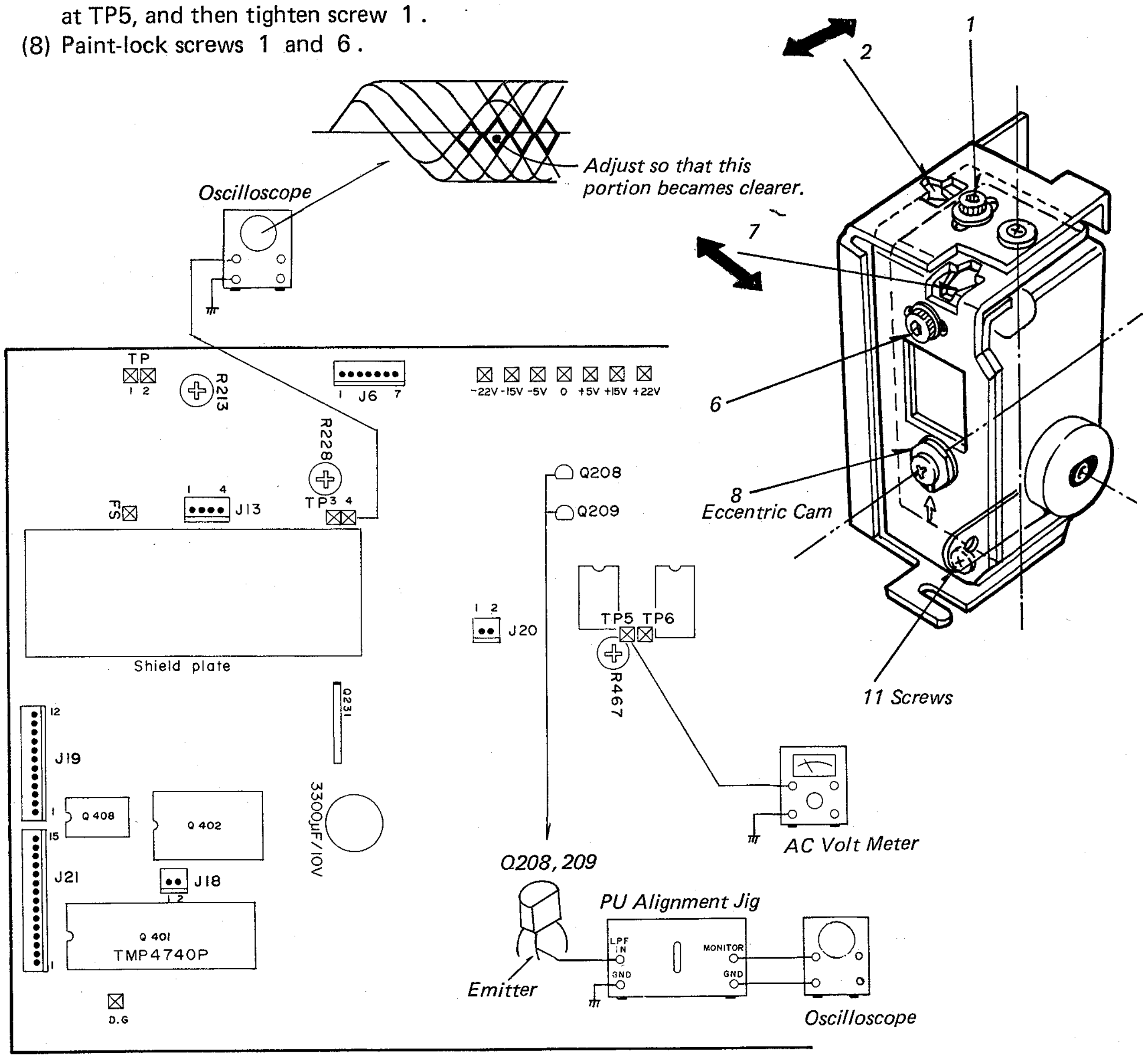
(4) Loosen screws 1 , 6 and 11 on the pickup, and load a TEST DISC A, and set the unit to PLAY mode of operation.
Adjust adjusting openings 2 and 7 provided on the pickup in directions shown by arrows, using a (–) screw driver until RF signal is developed at TP4 on the Servo P.C. Board, and then tighten the screw 1 temporarily.

(5) Adjust eccentric cam 8 so that emitter waveform developed at Q208 or Q209 (Focus coil drive voltage) swings from the center of 0V, while the inside track of the disc is being reproduces.

(6) Insert the (–) screw driver into adjusting opening 7 and adjust so that eye pattern (RF signal at TP4 on Servo P.C. Board) becomes clearest, and then tighten screws 6 and 11 .

(7) Insert the (–) screw driver into adjusting opening 2 and adjust so that minimum voltage is obtained at TP5, and then tighten screw 1 .

(8) Paint-lock screws 1 and 6 .


1
2
Adjust so that this portion becames clearer.
Oscilloscope
7
6
8
Eccentric Cam
11 Screws
TP
1 2
R213
J6
1 7
-22V -15V -5V 0 +5V +15V +22V
R228
TP3 4
1 4
J13
FS
Q208
Q209
Shield plate
1 2
J20
TP5 TP6
R467
Q231
12
J19
1
15
J21
Q408
Q402
3300μF/10V
J18
1 2
Q401
TMP4740P
D.G
AC Volt Meter
Q208, 209
PU Alignment Jig
LPF IN
GND
MONITOR
GND
Emitter
Oscilloscope

Servo P.C. Board (Top View)

[14-4] FOCUS BALANCE ALIGNMENT

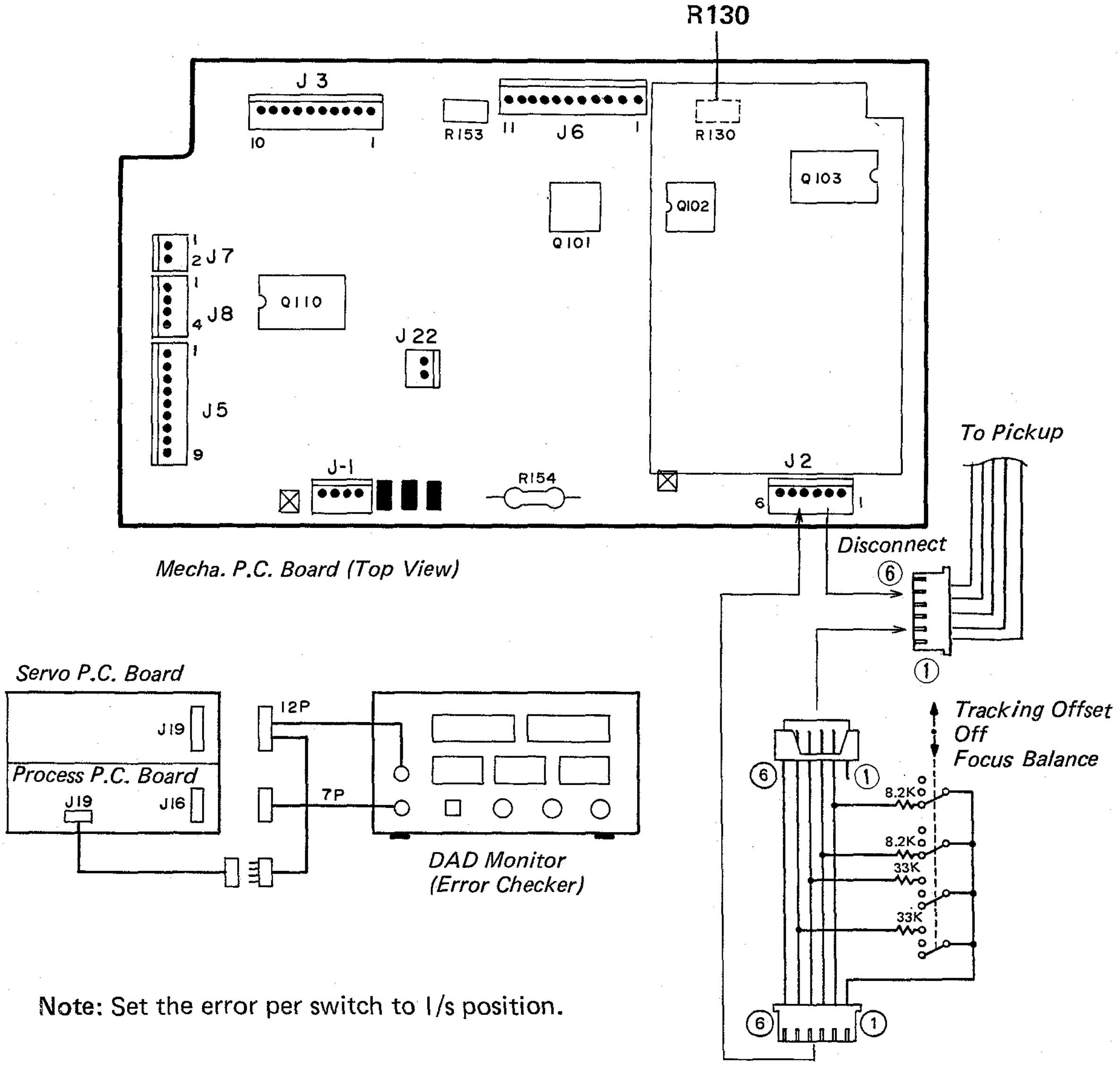
Item	Alignment Point	Measurement Point	Alignment Method
Focus Balance Alignment	R130	Servo P.C. Board J-19 Process P.C. Board J-16	Adjust to obtain correction numbers of 100 ∿ 1000.

Connection and Alignment Method

(1) Disconnect connector J-2 on Mechanism P.C. Board and connect connector cord.

(2) Connect DAD Monitor (error checker) connection cords to J-19 of Servo P.C. Board and J-16 & J-19 of Process P.C. Board as shown below.

(3) Load TEST DISC B and set the unit to PLAY mode. Adjust R130 so that correction factor of 100-1000 is obtained on the DAD Monitor. (Don't rotate R130 excessively, if so it may disturb correct adjustment.)


R130
J 3
10
1
R153
11
J6
1
R130
Q103
Q102
Q101
1
2 J7
1
4 J8
Q110
J 22
1
J5
9
J-1
R154
J 2
6
1
To Pickup
Disconnect
⑥
①
Tracking Offset
Off
Focus Balance
8.2KΩ
8.2KΩ
33K
33K
⑥
①
⑥
①
Servo P.C. Board
J19
Process P.C. Board
J19
J16
12P
7P
DAD Monitor
(Error Checker)

Mecha. P.C. Board (Top View)

Connector Cord

Note: Set the error per switch to I/s position.

[14-5] TRACKING ERROR OFFSET CHECK

Connection and Check Method

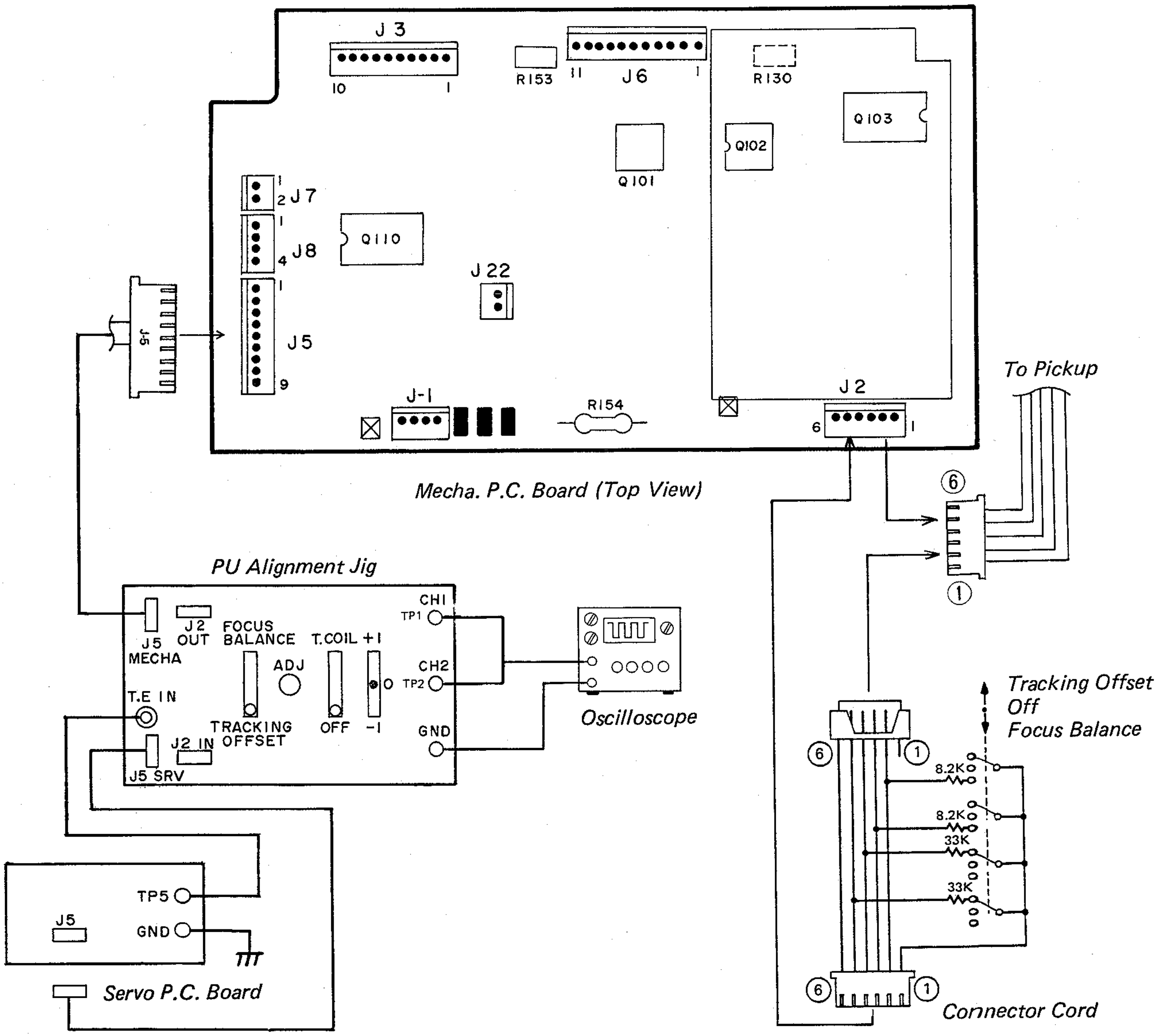
(1) Disconnect J-2 connector on Mechanism P.C. Board and connect connector cord. (The connector cord must be set to tracking offset.)

(2) Connect connector cords from the PU Alignment jig to J-5 connector on Mechanism P.C. Board and J-5 connector and TP5 on the Servo P.C. Board. Connect dual beam oscilloscope to TP1 and TP2 of the PU Alignment jig.

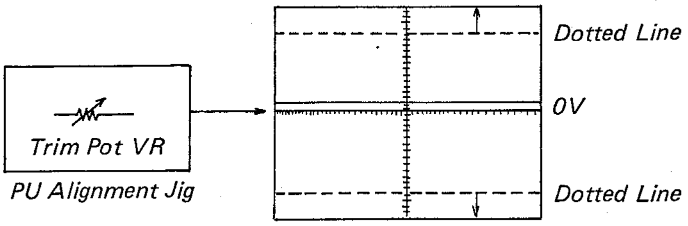
(3) Load TEST DISC C and set the unit to PLAY mode. Disconnect tracking coil of the PU Alignment jig by turning tracking coil switch off.

(4) Adjust trim pot in the PU Alignment jig so that both upper and lower dotted lines on scope display match to upper and lower solid lines as illustrated.

(5) When tracking coil switch in the PU Alignment jig is switched to "0V", "+1V" and "−1V" positions, check scope display as shown below is obtained, respectively. If abnormal display is observed, go back to the alignment "Pickup Position Alignment" and repeat the alignments.

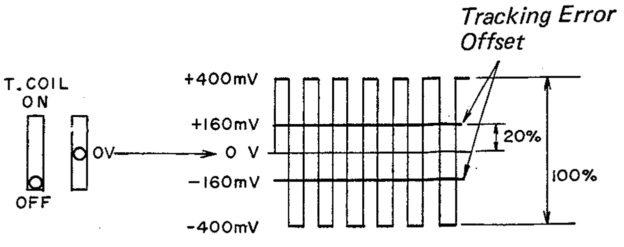

J 3
10
1
R153
11
J 6
1
R130
Q103
Q102
Q101
J7
J8
Q110
J 22
J5
9
J-1
R154
J 2
6
1
To Pickup
Mecha. P.C. Board (Top View)
⑥
①
PU Alignment Jig
J5
MECHA
J2
OUT
FOCUS
BALANCE
T.COIL
+1
CH1
TP1
ADJ
CH2
TP2
0
T.E IN
TRACKING
OFFSET
OFF
−1
GND
J2 IN
J5 SRV
Oscilloscope
Tracking Offset
Off
Focus Balance
8.2KΩ
8.2KΩ
33K
33K
TP5
GND
J5
Servo P.C. Board
Connector Cord

Adjust the trim pot until both dotted lines are super-imposed on upper and lower solid lines as illustrated.


Trim Pot VR
PU Alignment Jig
Dotted Line
0V
Dotted Line

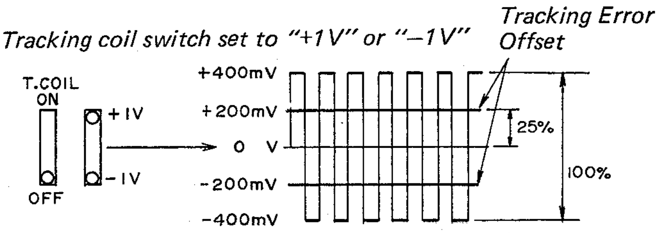
Oscilloscope (Pattern)
(Make Range CH 1, CH 2 to 100mV)

Tracking coil switch set to "0V".


Tracking Error Offset
T.COIL ON
OFF
0V
+400mV
+160mV
0 V
−160mV
−400mV
20%
100%

Oscilloscope (Pattern)

Tracking coil switch set to "+1V" or "−1V"


Tracking Error Offset
T.COIL ON
OFF
+1V
−1V
+400mV
+200mV
0 V
−200mV
−400mV
25%
100%

Oscilloscope (Pattern)

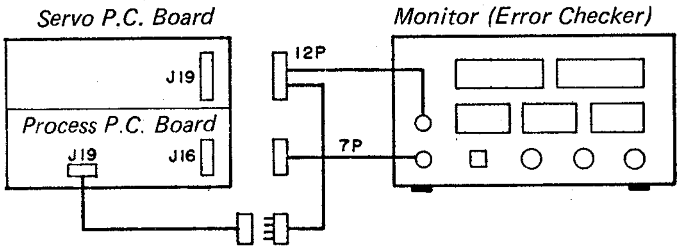
1. Set oscilloscope ranges (for CH1 & CH2) to 100mV.
2. With oscilloscope's dotted lines set to ±400mV, the tracking error offset should be: ±160mV (20%) at tracking error switch set to 0V position, ±200mV (25%) at ±1V position.

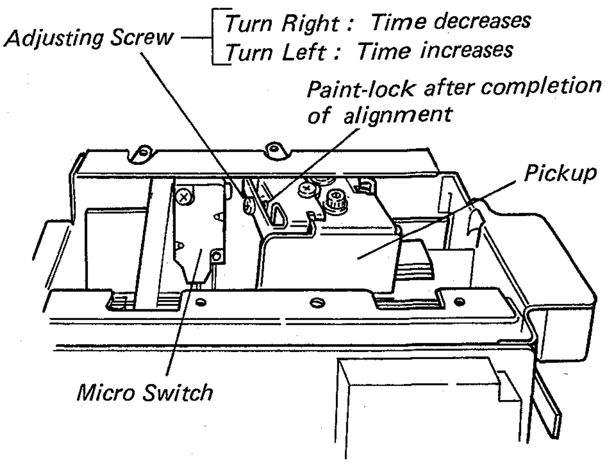
[14-6] PICKUP STARTING POSITION ALIGNMENT

(1) Connect DAD Monitor (error checker) to J-9 connector of Servo P.C. Board and connectors J-16 and J-19 on the Processor P.C. Board.

(2) Load TEST DISC C and playback. Adjust adjusting screw so that the display of music number and time indicated immediately after the eject cover is closed is "0" (music number), "0" (minute), "40" (seconds) ±13 sec. (Refer to illustration below.)

Connection & Alignment Method


Servo P.C. Board
J19
Process P.C. Board
J19
J16
12P
7P
Monitor (Error Checker)


Adjusting Screw
Turn Right : Time decreases
Turn Left : Time increases
Paint-lock after completion of alignment
Pickup
Micro Switch

After completion of replacement of Pickup and alignment steps [14-1] ∿ [14-6], alignments for focus gain, tracking gain, and focus limit should be conducted without fail by referring [14-7] ∿ [14-9].

[14-7] SERVO GAIN ALIGNMENT

Item	Alignment Point	Measurement Point	Alignment Method
Focus Gain Alignment	R213	TP 1 TP 2	Use signal generator and PU alignment jig, and adjust to obtain 40mV output.

Connection and Alignment Method

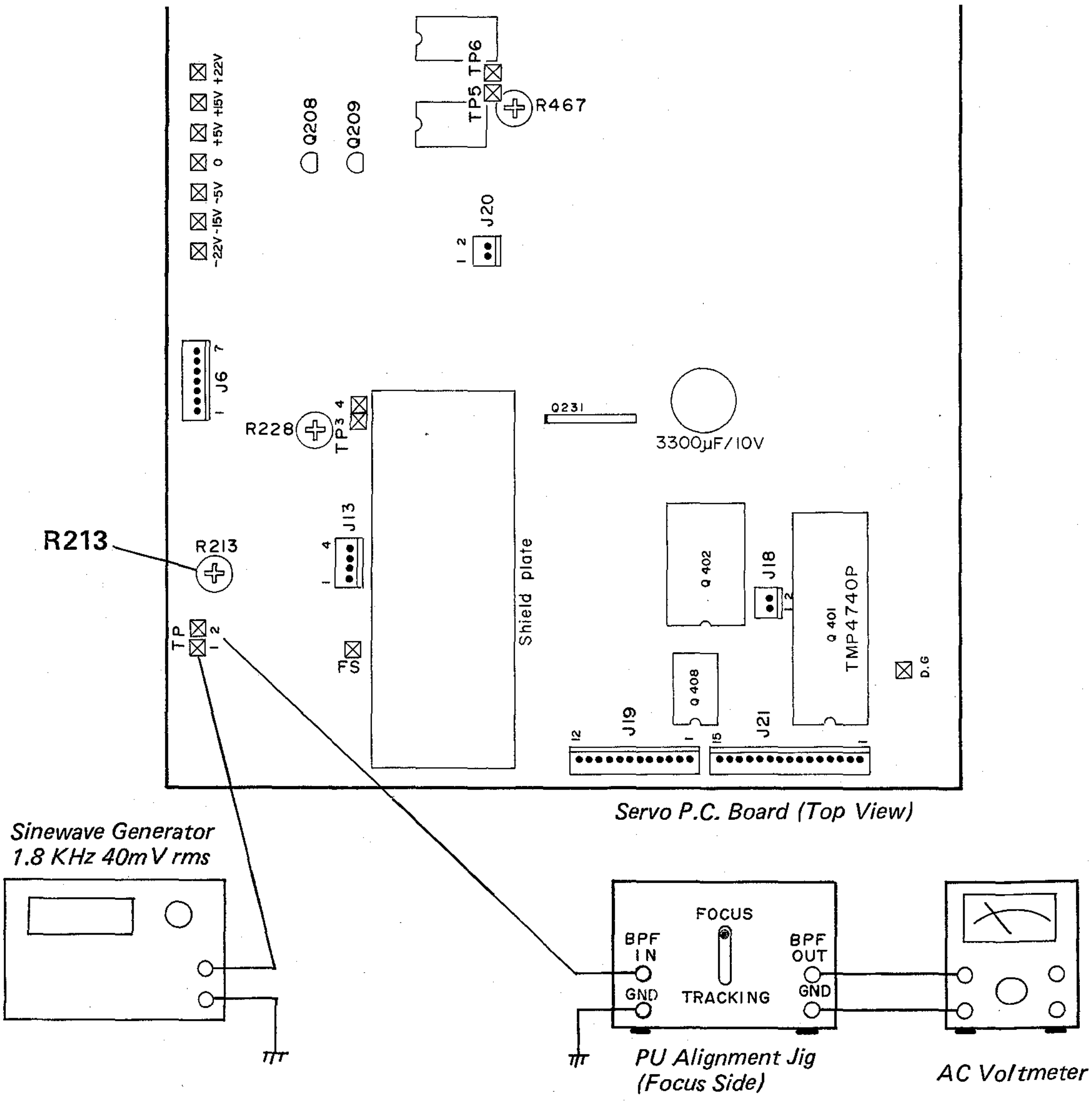
(1) Connect signal generator output (1.8 KHz, 40mV) to input terminals of the PU Alignment jig and connect AC voltmeter to the output terminals of the PU Alignment jig. (Set PU Alignment jig to FOCUS side.)

(2) Confirm signal generator output is set to 40mV by temporarily connecting the AC voltmeter, if not adjust the generator output to provide 40mV output.

(3) Connect the generator to TP1 on Servo P.C. Board, and PU Alignment jig to TP2.

(4) Load TEST DISC A and set the unit to PLAY mode.

(5) Adjust R213 to obtain 40mV reading on the voltmeter.

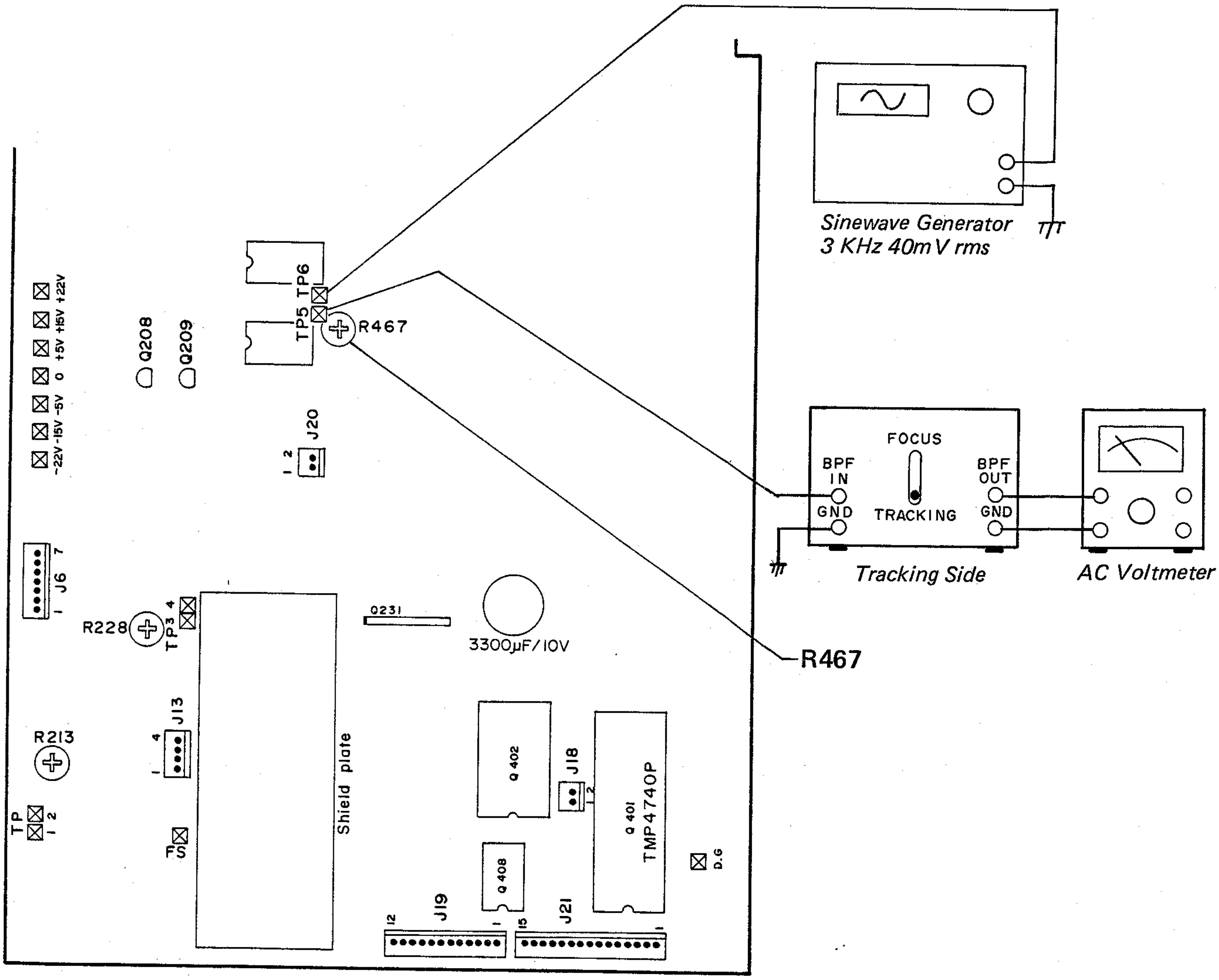

-22V -15V -5V 0 +5V +15V +22V
Q208
Q209
TP5 TP6
R467
J20
1 2
J6
1 7
R228
TP3 4
Q231
3300μF/10V
R213
R213
J13
1 4
Shield plate
Q402
J18
1 2
Q401
TMP4740P
TP 2 1
FS
D.G
Q408
J19
12 1
J21
15 1
Servo P.C. Board (Top View)
Sinewave Generator
1.8 KHz 40mV rms
FOCUS
BPF IN
GND
TRACKING
BPF OUT
GND
PU Alignment Jig
(Focus Side)
AC Voltmeter

[14-8] TRACKING GAIN ALIGNMENT

Item	Alignment Point	Measurement Point	Alignment Method
Tracking Gain Alignment	R467	TP 5 TP 6	Use signal generator and PU alignment jig, and adjust to obtain 40mV output.

Connection and Alignment Method

(1) Connect generator output (3 KHz, 40mV) to input terminals of PU Alignment jig and the PU Alignment jig output to AC voltmeter. (Set the PU Alignment jig to TRACKING side.)
(2) Confirm signal generator output is set to 40mV by temporarily connecting the AC voltmeter, if not adjust the generator output to provide 40mV output.
(3) Connect the generator to TP6 on Servo P.C. Board, and PU Alignment jig to TP5.
(4) Load TEST DISC A and set the unit to PLAY mode.
(5) Adjust R467 to obtain 40mV reading on the voltmeter.


Sinewave Generator
3 KHz 40mV rms
FOCUS
BPF IN
GND
TRACKING
BPF OUT
GND
Tracking Side
AC Voltmeter
R467
TP5 TP6
R467
Q208
Q209
J20
-22V -15V -5V 0 +5V +15V +22V
J6
R228
TP3
Q231
3300μF/10V
R213
J13
Shield plate
Q402
J18
Q401 TMP4740P
Q408
J19
J21
D.G
TP
FS

Servo P.C.Board (Top View)

[14-9] FOCUS LIMIT ALIGNMENT

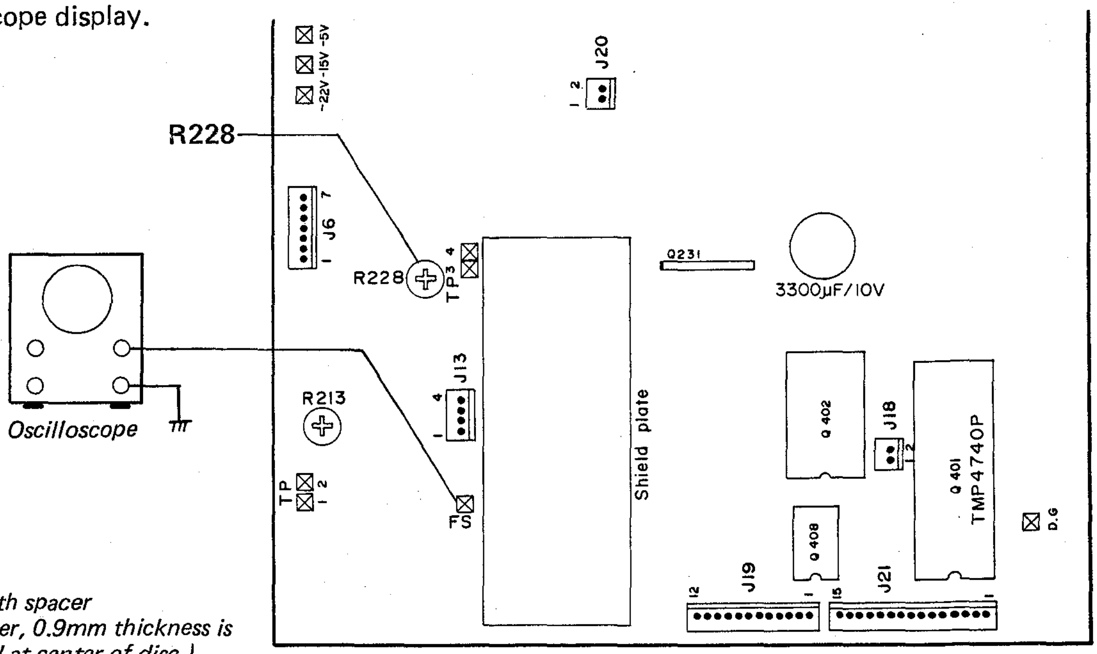
Item	Alignment Point	Measurement Point	Alignment Method
Focus Limit Adjustment	R228	FS	Adjust until FS waveform appears over positive area on scope display.

Connection and Alignment Method

(1) Disconnect J-7 connector on the Mechanism P.C. Board.

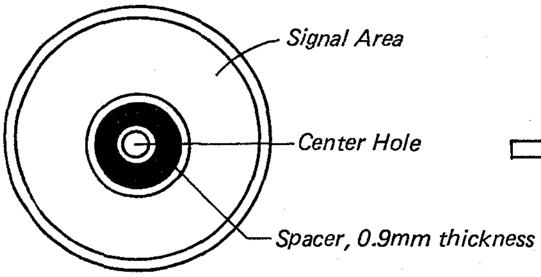
(2) Connect oscilloscope to FS terminals on Servo P.C. Board.

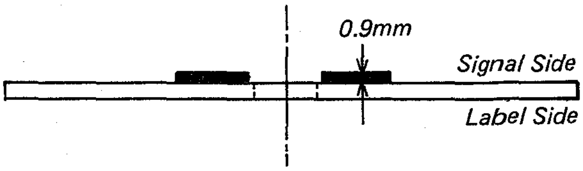
(3) Load TEST DISC D (with 0.9mm thickness spacer) and close the door.
Adjust R228 during the pickup is moving in left direction so that FS waveform appear on positive area on scope display.

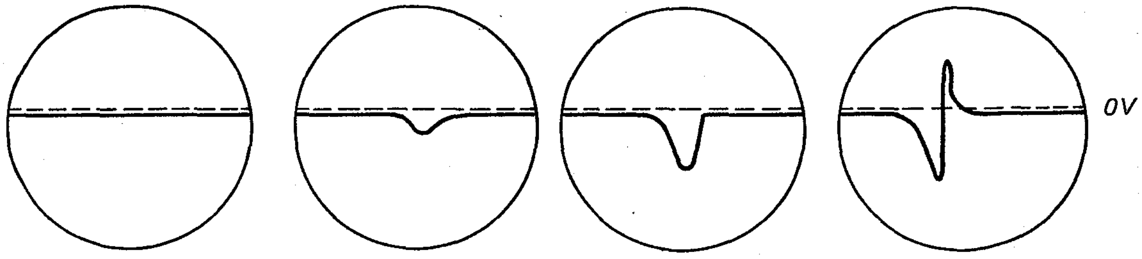

-22V -15V -5V
J20
1 2
R228
J6
1 7
R228
TP3 4
Q231
3300µF/10V
Oscilloscope
J13
1 4
R213
TP
1 2
FS
Shield plate
Q402
J18
1 2
Q401
TMP4740P
D.G
Q408
J19
12 1
J21
15 1

Servo P.C. Board (Top View)

Disc with spacer
(A spacer, 0.9mm thickness is adhered at center of disc.)


Signal Area
Center Hole
Spacer, 0.9mm thickness


0.9mm
Signal Side
Label Side



R228 Fully Counter Clockwise ——→ Rotate Clockwise ——→ Correct Position Adjusted

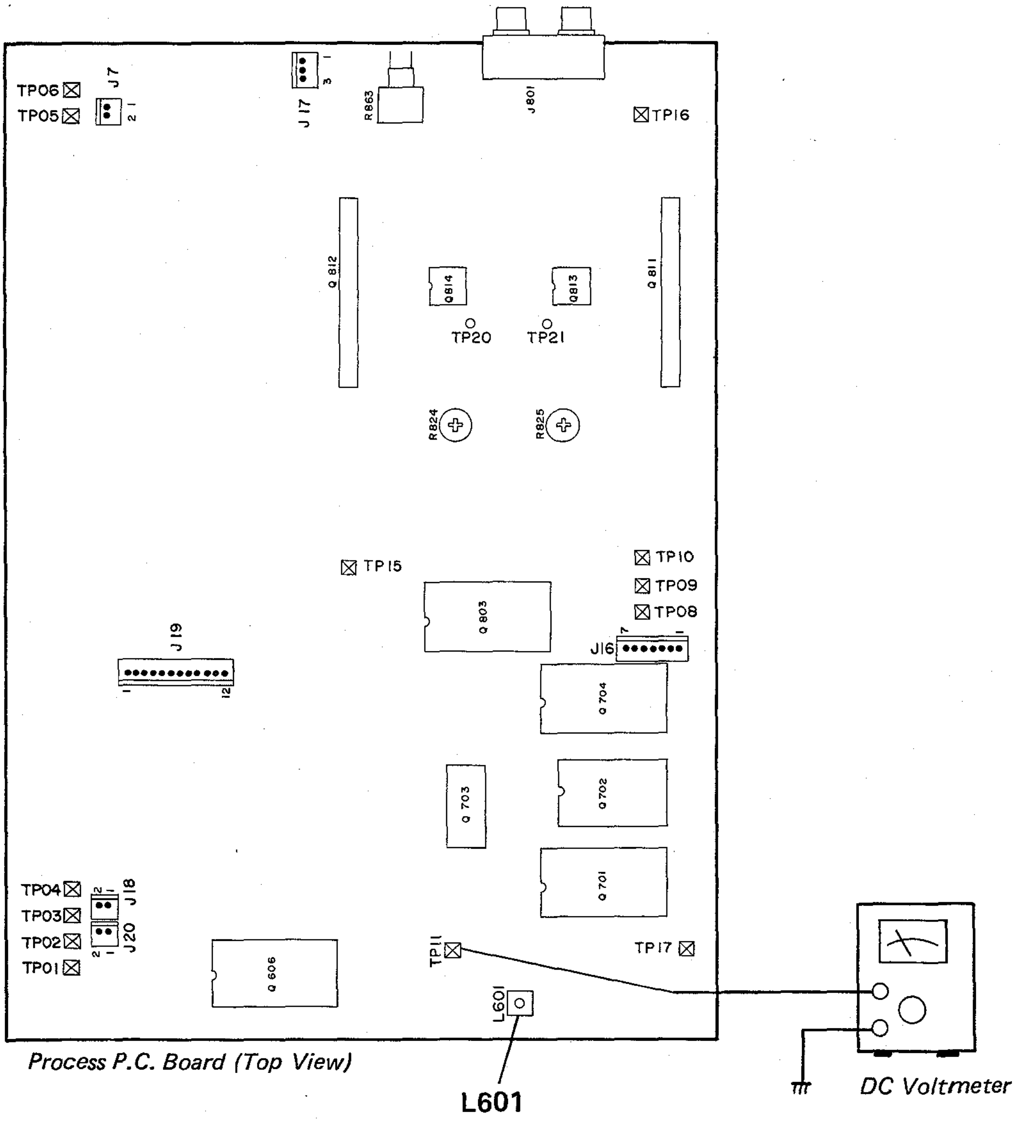
[14-10] VCO OSCILLATOR COIL ALIGNMENT

Item	Alignment Point	Measurement Point	Alignment Method
VCO Oscillator Coil Alignment	L601	TP 11	Adjust to obtain 4.5V during playback mode, using a RF alignment driver.

Connection and Alignment Method

(1) Connect DC voltmeter to TP11 on Process P.C. Board.

(2) Load a disc (not specified) and set the unit to PLAY mode. Adjust L601 until DC voltmeter reads 4.5V, using a RF type alignment driver.


TP06
TP05
J7
J17
R863
J801
TP16
Q812
Q814
Q813
Q811
TP20
TP21
R824
R825
TP15
TP10
TP09
TP08
Q803
J19
J16
Q704
Q703
Q702
Q701
TP04
TP03
TP02
TP01
J18
J20
Q606
TP11
TP17
L601
Process P.C. Board (Top View)
L601
DC Voltmeter

Note: Always use a non metal driver.

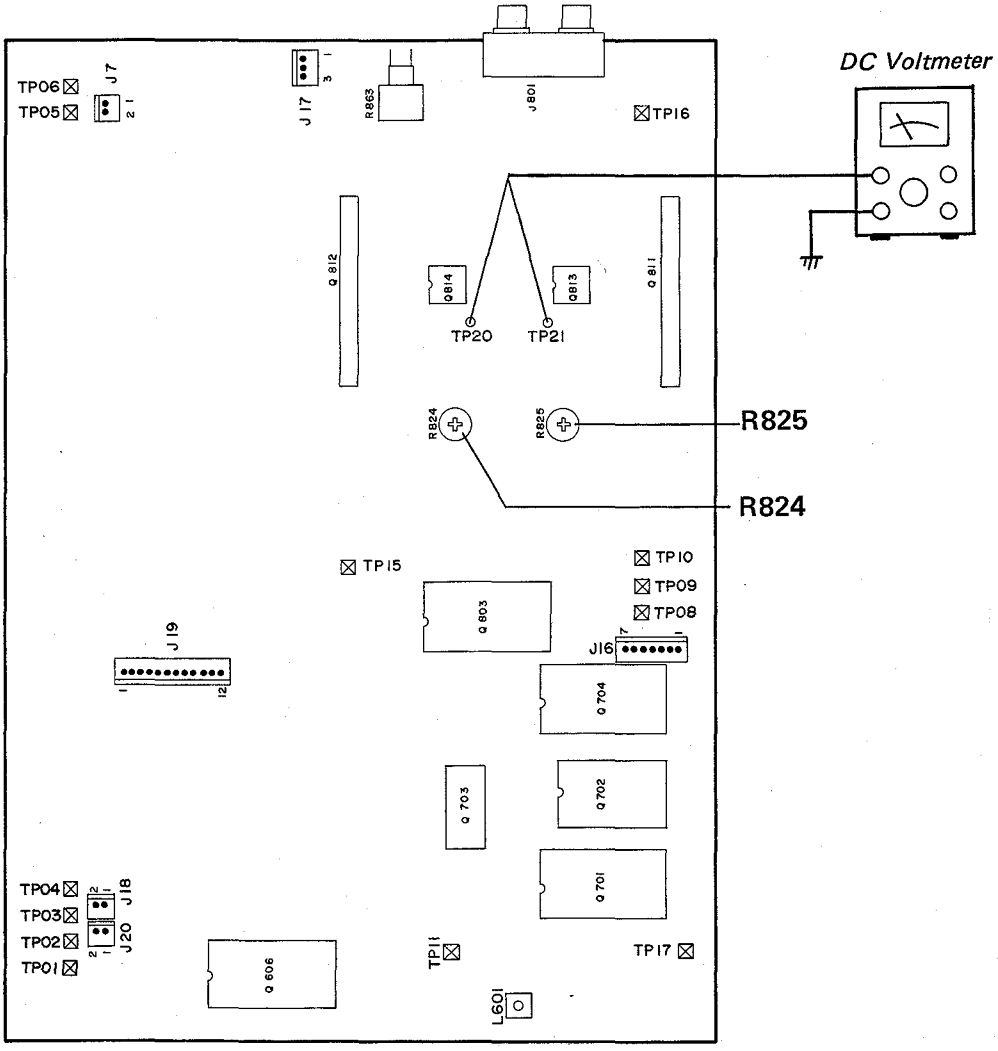
[14-11] DC OFFSET ALIGNMENT

Item	Alignment Point	Measurement Point	Alignment Method
DC Offset Alignment	R824 (Rch) R825 (L ch)	TP 20 (R ch) TP 21 (L ch)	Adjust until 0V ±50mV is obtained at TP 20 or TP 21 under PAUSE mode.

Connection and Alignment Method

(1) Connect DC voltmeter to TP20 (R Ch) or TP21 (L Ch) on Processor P.C. Board.

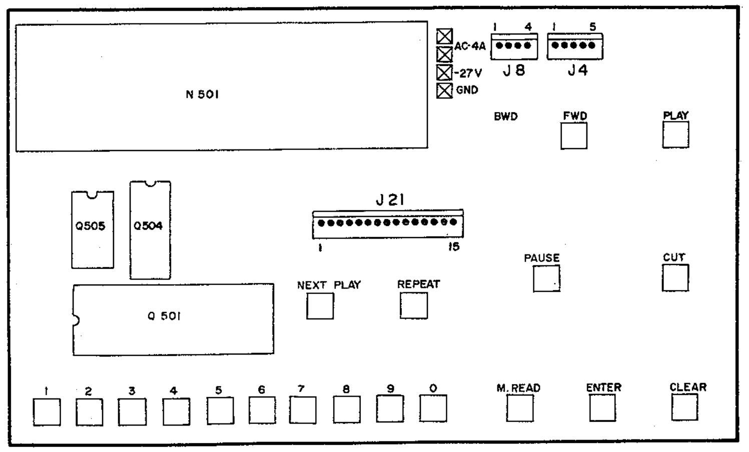
(2) Load a disc (not specified), and set the unit to PLAY mode and then to PAUSE mode. Adjust R824 and R825 until DC voltmeter indicates 0V ±50mV.


DC Voltmeter
TP06
TP05
J7
J17
R863
J801
TP16
Q812
Q814
Q813
Q811
TP20
TP21
R824
R825
R825
R824
TP15
TP10
TP09
TP08
Q803
J16
J19
Q704
Q703
Q702
Q701
TP04
TP03
TP02
TP01
J18
J20
Q606
TP11
TP17
L601

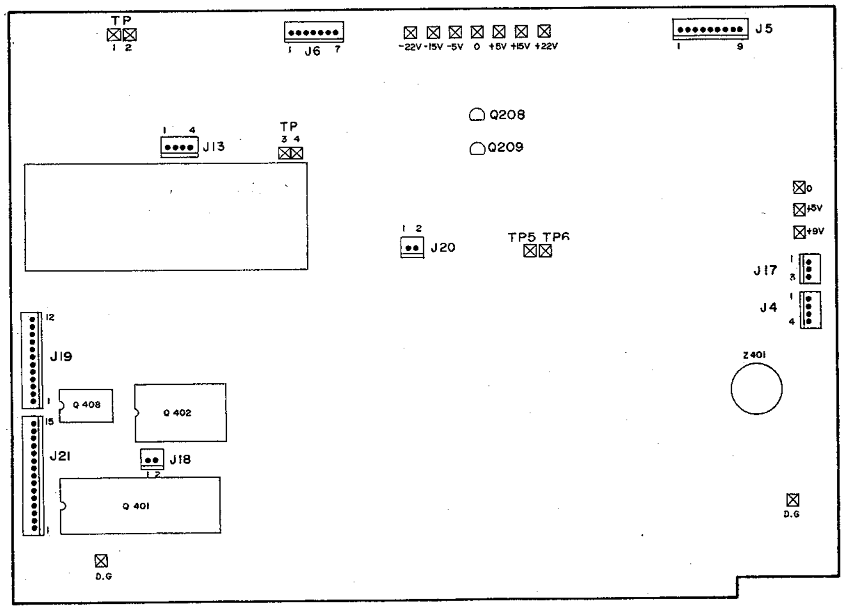
Process P.C. Board (Top View)

■ ■ P.C. BOARD PARTS LAYOUT

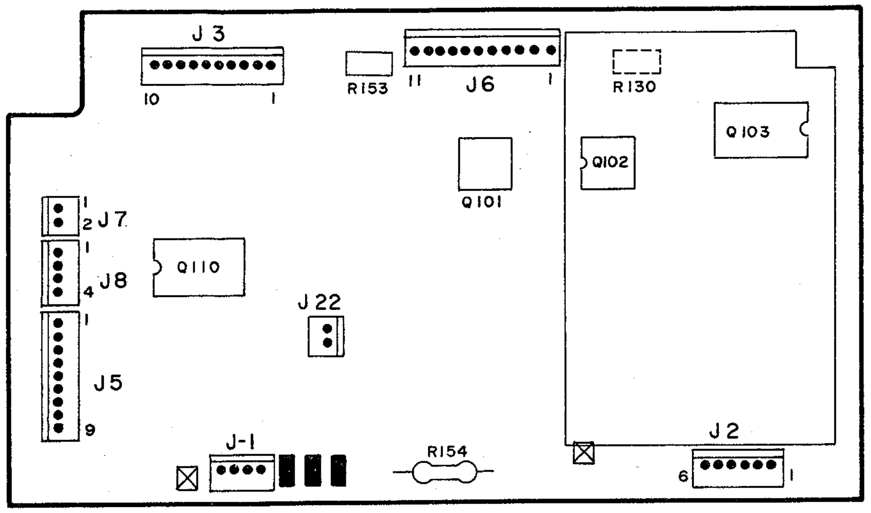
Display & Switch P.C.B.


N 501
AC-4A
-27V
GND
J 8
J4
1 4
1 5
BWD
FWD
PLAY
Q505
Q504
J 21
1
15
NEXT PLAY
REPEAT
PAUSE
CUT
Q 501
1 2 3 4 5 6 7 8 9 0
M.READ
ENTER
CLEAR

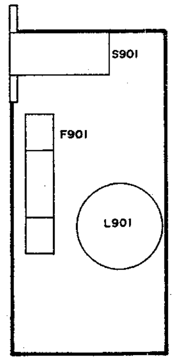
Servo P.C.B.


TP
1 2
J6
1 7
-22V -15V -5V 0 +5V +15V +22V
J5
1 9
Q208
Q209
1 4
J13
TP
3 4
0
+5V
+9V
1 2
J20
TP5 TP6
J17
1
3
J4
1
4
Z401
12
J19
1
15
J21
1
Q 408
Q 402
J18
Q 401
D.G
D.G

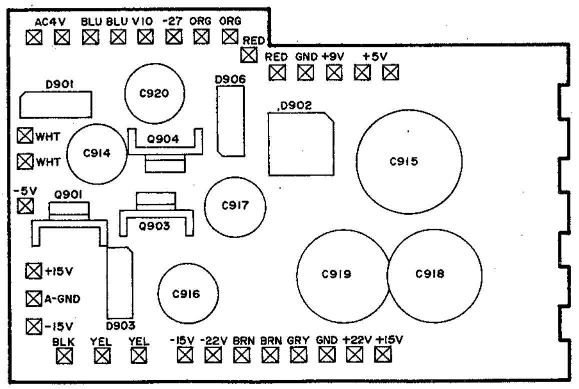
Mechanism P.C.B.

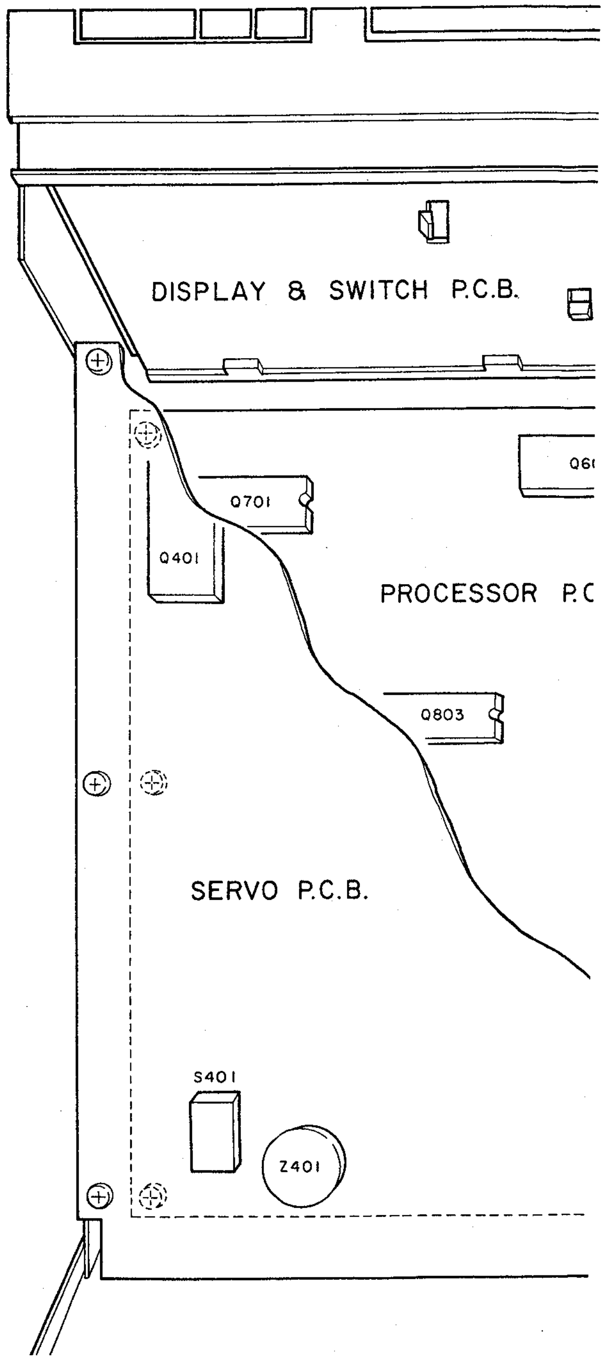

J 3
10 1
R153
11 J6 1
R130
Q 103
Q102
Q101
1
2 J 7
1
4 J8
Q110
J 22
1
J5
9
J-1
R154
J 2
6 1

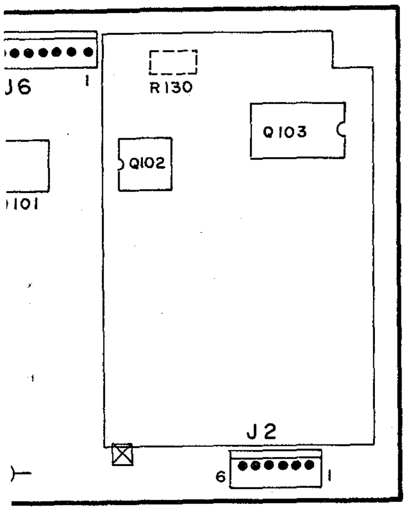
Power Switch P.C.B.


S901
F901
L901

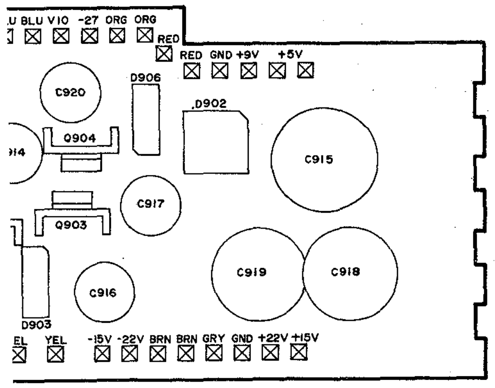
Power Supply P.C.B.

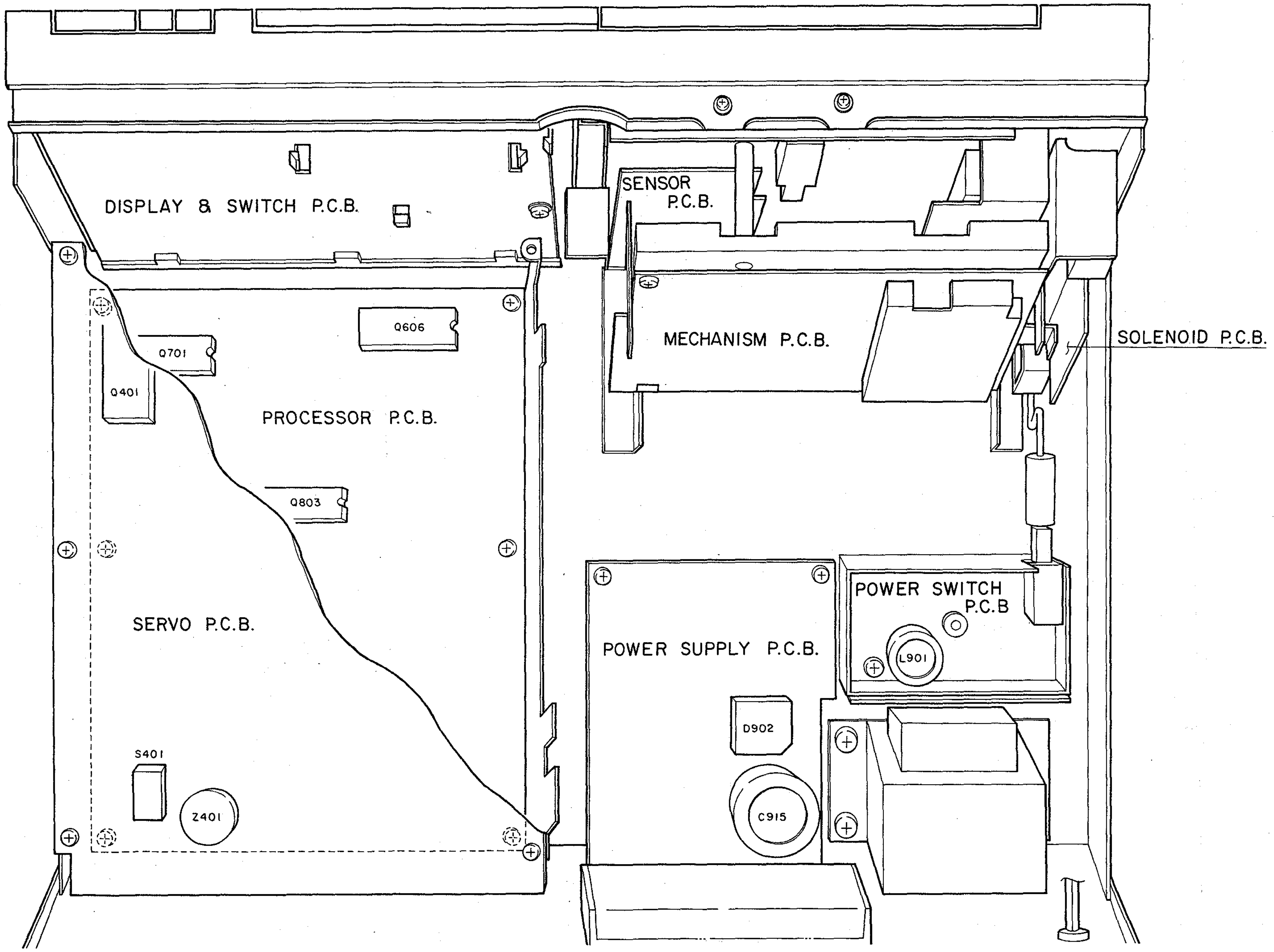

AC4V BLU BLU V10 -27 ORG ORG
RED
RED GND +9V +5V
D901
C920
D906
D902
WHT
WHT
C914
Q904
C915
-5V
Q901
Q903
C917
+15V
A-GND
-15V
D903
C916
C919
C918
BLK YEL YEL -15V -22V BRN BRN GRY GND +22V +15V


DISPLAY & SWITCH P.C.B.
Q6
Q701
Q401
PROCESSOR P.C
Q803
SERVO P.C.B.
S401
Z401


J6
1
R130
Q103
Q102
101
J2
6
1

Supply P.C.B.

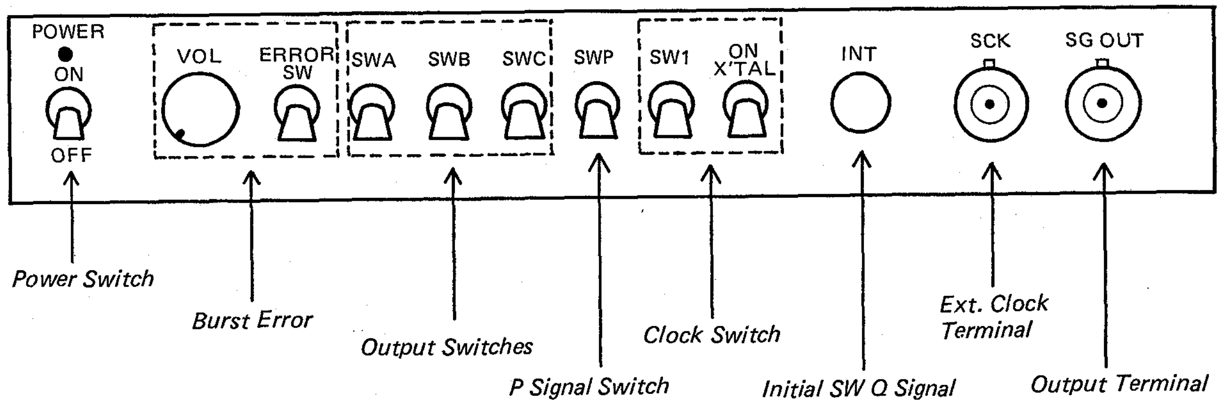

U
BLU
VIO
-27
ORG
ORG
RED
RED
GND
+9V
+5V
C920
D906
D902
Q904
14
C915
C917
Q903
C916
C919
C918
D903
EL
YEL
-15V
-22V
BRN
BRN
GRY
GND
+22V
+15V


DISPLAY & SWITCH P.C.B.
SENSOR P.C.B.
MECHANISM P.C.B.
SOLENOID P.C.B.
Q606
Q701
Q401
PROCESSOR P.C.B.
Q803
SERVO P.C.B.
S401
Z401
POWER SUPPLY P.C.B.
POWER SWITCH P.C.B
L901
D902
C915

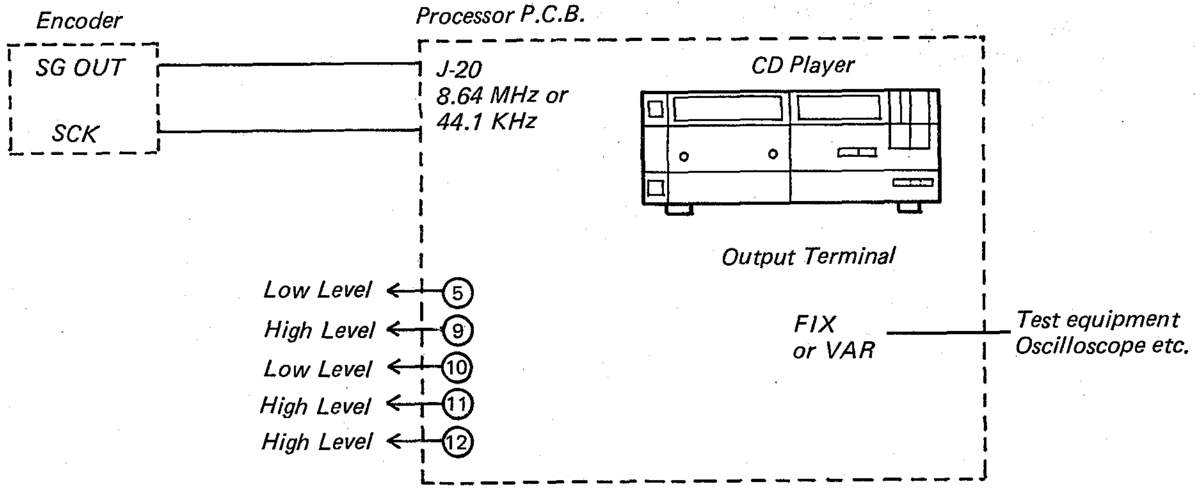
[14-12] HOW TO USE SIMPLE TYPE ENCODER

How to Use Simple type Encoder
The encoder is an EFM signal generator required to measure the Processor section, especially digital signal processing circuits and operations in DAC section in the DAD player. Operating method of the encoder will be shown below.

[1] Front Panel Description


POWER
ON
OFF
VOL
ERROR SW
SWA
SWB
SWC
SWP
SW1
ON X'TAL
INT
SCK
SG OUT
Power Switch
Burst Error
Output Switches
P Signal Switch
Clock Switch
Initial SW Q Signal
Ext. Clock Terminal
Output Terminal

[2] Connections with Unit


Encoder
SG OUT
SCK
Processor P.C.B.
J-20
8.64 MHz or
44.1 KHz
CD Player
Output Terminal
Low Level ⑤
High Level ⑨
Low Level ⑩
High Level ⑪
High Level ⑫
FIX
or VAR
Test equipment
Oscilloscope etc.

Change Clock Switch in sequence as shown.

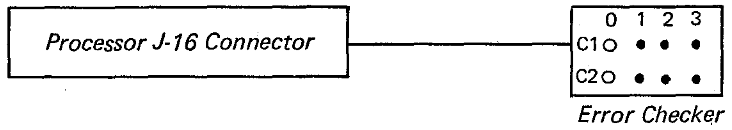
SW1	ON X'TAL	Clock
↓(OFF)	↓	8.64 MHz external clock Connect Q801(5) and SCK.
↑(ON)	↓	44.1 KHz external clock
	↑	8.64 MHz external clock Do not connect anything to SCK.

[3] Measurement Method

- Change signal frequency with Output Switches (SWA, SWB, SWC) and various measurements (S/N ratio, distortion, frequency response, separation, etc.) can be made.

SWA	SWB	SWC	Lch	Rch
↓ (OFF)	↓	↓	0	0
↑ (ON)	↓	↓	14.7 kHz	14.7 kHz
↓	↑	↓	7.35 kHz	7.35 kHz
↑	↑	↓	6.3 kHz	6.3 kHz
↓	↓	↑	3.15 kHz	3.15 kHz
↑	↓	↑	0	1.05 kHz
↓	↑	↑	1.05 kHz	0
↑	↑	↑	1.05 kHz	1.05 kHz

- Error correction capability can be checked by making use of Burst Error. (VOL and ERROR switch)


Processor J-16 Connector
0 1 2 3
C1○ ● ● ●
C2○ ● ● ●
Error Checker

When ERROR SW is placed in OFF position, green LEDs in "0" column light up. (In the event of internal clock, red LED may lights up when synchronization is disturbed sometimes.)

With ERROR SW placed in ON position, the red LEDs in columns 1, 2 and 3 begin to turn on in this sequence (especially LEDs in raw "C2"), as the VOL. control is turned in clockwise direction. At the same time, distortion of the waveform will be increased gradually.

○ P signal can be set to "1" or "0" with "P" switch set to:
$\boxed{\text{ON}}$ = "1"
$\boxed{\text{OFF}}$ = "0"

Note: In XR-Z90, the P signal can not be eliminated as long as a proper circuit is added.

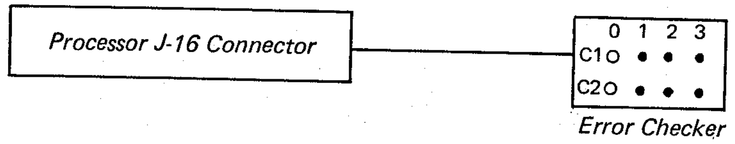
○ **Q Signal Initial Switch**
This switch functions in relation to SUBCODE input from a rear panel connector. Pin configurations are:
Data in, Start G, CK out, R GND, but their details are not decided.

Measurement Method

- Change signal frequency with Output Switches (SWA, SWB, SWC) and various measurements (S/N ratio, distortion, frequency response, separation, etc.) can be made.

WA	SWB	SWC	Lch	Rch
↓ (OFF)	↓	↓	0	0
↑ (ON)	↓	↓	14.7 kHz	14.7 kHz
↓	↑	↓	7.35 kHz	7.35 kHz
↑	↑	↓	6.3 kHz	6.3 kHz
↓	↓	↑	3.15 kHz	3.15 kHz
↑	↓	↑	0	1.05 kHz
↓	↑	↑	1.05 kHz	0
↑	↑	↑	1.05 kHz	1.05 kHz

rror correction capability can be checked by making use of Burst Error. (VOL nd ERROR switch)



Error Checker

n ERROR SW is placed in OFF position, green LEDs in "0" column light up. (In the t of internal clock, red LED may lights up when synchronization is disturbed somes.)

ERROR SW placed in ON position, the red LEDs in columns 1, 2 and 3 begin to on in this sequence (especially LEDs in raw "C2"), as the VOL. control is turned in wise direction. At the same time, distortion of the waveform will be increased ually.

signal can be set to "1" or "0" with "P" switch set to:
N = "1"
FF = "0"

: In XR-Z90, the P signal can not be eliminated as long as a proper circuit is added.

Signal Initial Switch

is switch functions in relation to SUBCODE input from a rear panel connector. Pin nfigurations are:
ta in, Start G, CK out, R GND, but their details are not decided.

[14-13] PROCESSOR P.C.B. CHECK USING ENCODER

Most circuits in process P.C. Boards can be checked by using a simply type DAD encoder.

1. Connections of Encoder
   (1) Disconnect J-20 on Sero P.C. Board and connect to SG OUT terminal, using a shield-wire.
   (2) Disconnect J-19 on servo P.C. Board, and set voltages at pin ⑤ and ⑩ to 0V, and voltages at pins ⑨, ⑪ and ⑫ to 5V.
   (3) Disconnect J-7 on Mecha. P.C. Board (to disable the DISC Motor).
   (4) Turn Encoder Power ON and set it to:
       ERROR SW = OFF, SW1 = OFF
       SW1 = ON
       ON X'TAL = ON
       SW A, B, C = All ON
       (to set internal clock ON and both channel outputs to 10.5 KHz conditions.)
   (5) Turn the player power on with the door left open.

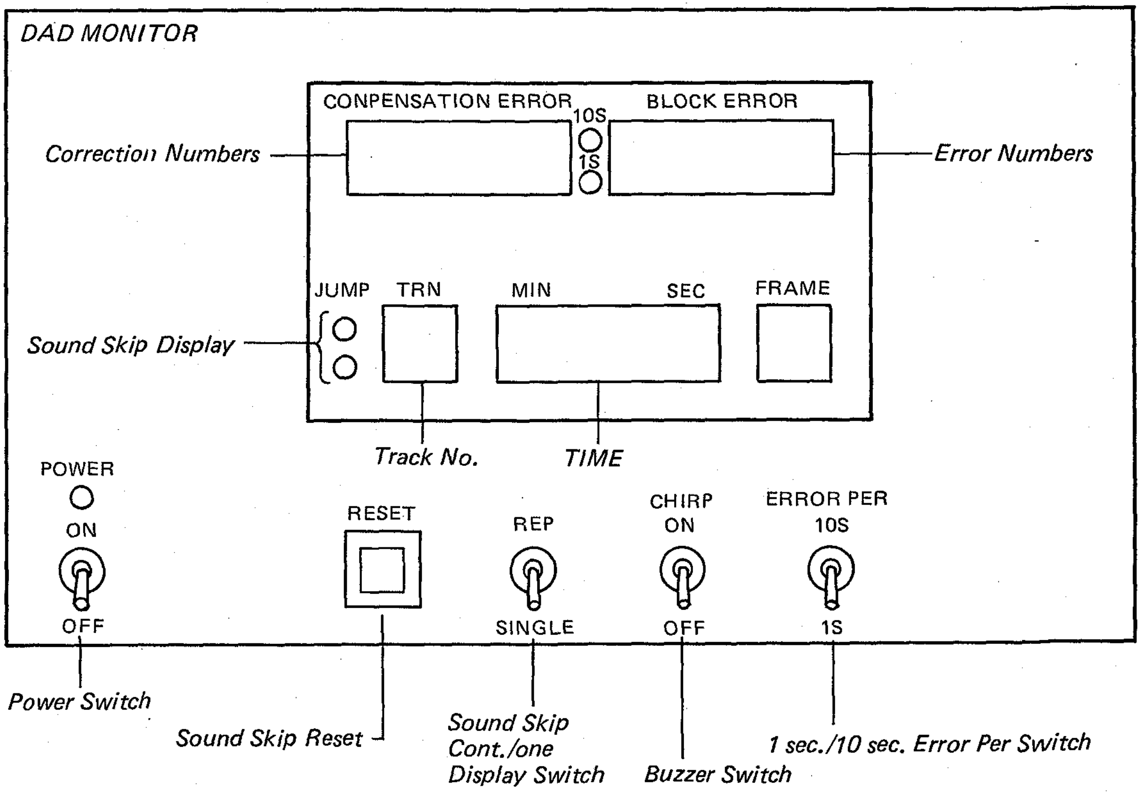
2. Check following Circuits (Signals may sometimes be disturbed because no synchronization is established between the unit and encoder.)
   - [7] Process circuit (1)
   - [8] Process circuit (2), and System clock circuit
   - [9] PLL circuit
   - [10] CLV circuit
   - [11] DAC, Power Mute circuit

3. Load a disc and close the door.
   Continue to forcus-search for approx. 20 seconds (actuator section of the pick-up will move back and forth at a rate of 3 Hz), the unit is normal if the disc is ejected. If not ejected, check associated circuits.

[14-14] HOW TO USE DAD MONITOR

The DAD Monitor is a jig which locates places where sound skip is occured due to scratches on a disc.

Displays and Switches


DAD MONITOR
CONPENSATION ERROR
10S
1S
BLOCK ERROR
Correction Numbers
Error Numbers
JUMP
TRN
MIN
SEC
FRAME
Sound Skip Display
Track No.
TIME
POWER
ON
OFF
RESET
REP
SINGLE
CHIRP
ON
OFF
ERROR PER
10S
1S
Power Switch
Sound Skip Reset
Sound Skip Cont./one Display Switch
Buzzer Switch
1 sec./10 sec. Error Per Switch

Connection to Unit

- Connection is made to J-19 on servo P.C.B., using jumper cables.
- Connected to J-16 on Process P.C.B.

To Observe Sound Skip

- Set ERROR PER switch in either 10s or 1s position.
- If REP is selected, continuous display is obtained if sound skip is caused. If SINGLE position is selected, time display stops when sound skip is occured.
  Pushing the RESET switch resumes the operation of display.

[15] FAILURES RELATING MECHANISM

[15-1] DISC NOT LOADED SMOOTHLY

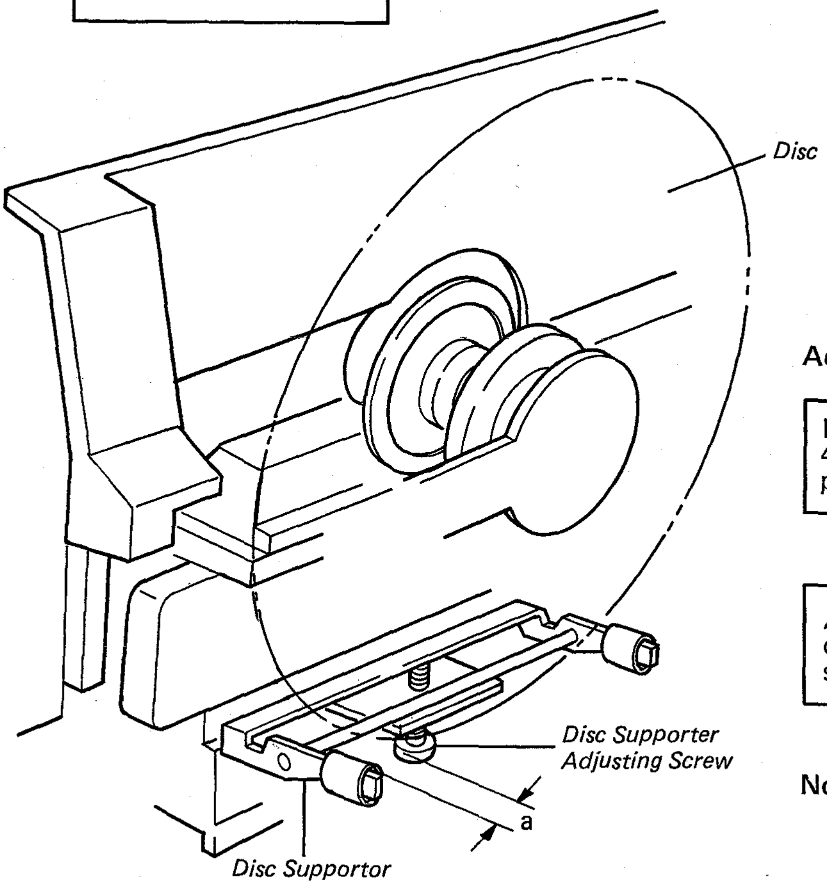
Are in-and-outside-diameters of disc correct? → N → Disc no good

↓ Y

Adjust DISC supporter

Outside Dia. $\phi 120 \pm 0.3$

Inside Dia. $\phi 15 \, ^{+0.1}_{-0}$


Disc
Disc Supporter Adjusting Screw
a
Disc Supportor

Adjusting Method

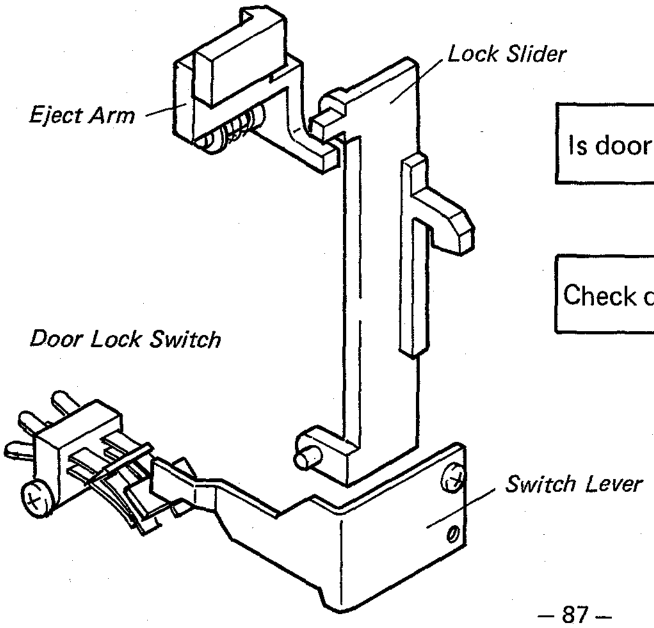
Is there clearance of a = 4mm between disc supporter and disc?

↓

Adjust the clearance by disc supporter adjusting screw.

Note: Turning the screw clockwise increases the clearance a.

[15-2] FAILURES RELATING DOOR LOCK


Lock Slider
Eject Arm
Door Lock Switch
Switch Lever

Is door lock sw being pushed fully?

↓ N

Check door lock sw and switch lever → NG, Replace

[15-3] PLUNGER WORKS, BUT DOOR NOT MOVE

Plunger A works good

↓ N

Check clearance = "a" between lock-slider and disc holder.

↓

Is there clearance of 0.6 ∿ 1mm.

N ↓

Adjust position with plunger A securing screws. (Clearance of 0.6 ∿ 1mm should be left during operation.)

Plunger B works good

↓

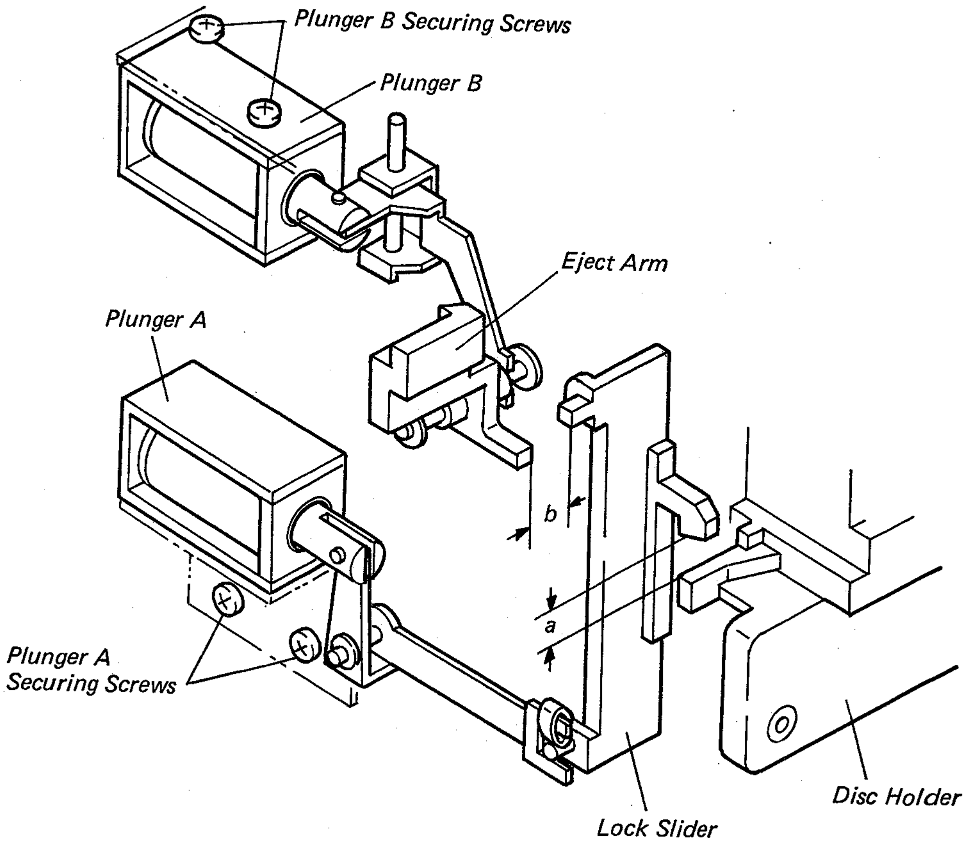
Check clearance "b" between EJECT arm and lock slider.

↓

Is there clearance of 0.6 ∿ 1mm?

N ↓

Adjust position with plunger "B" securing screws. (Clearance of 0.6 ∿ 1mm should be left during operation.)

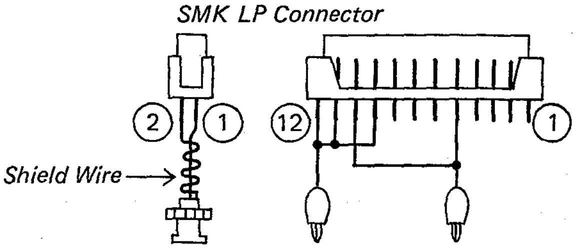

Plunger B Securing Screws
Plunger B
Eject Arm
Plunger A
b
a
Plunger A Securing Screws
Disc Holder
Lock Slider

[16] DATA ON TEST EQUIPMENT USED

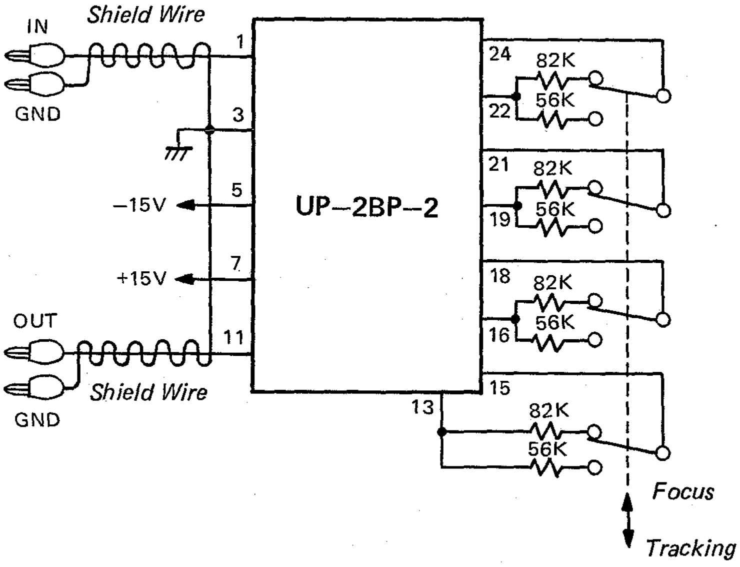
● Synchroscope	Frequency Range Input Impedance	Higher than DC – 40 MHz Higher than 1M ohm
● AC Volt meter (with A-network)	Input Voltage Range Accuracy	0.01mV ∿ 10V Less than ±3%
● Distortion Meter	Measurement Range Fundamental Wave Rejection Ratio Input Level	0.003 ∿ 30% 10 Hz ∿ 20 kHz → higher than 100 dB Higher than 0.1V
● Generator	OSC Frequency (Sine wave) Output Voltage Output Impedance	1 kHz ∿ 10 kHz Higher than 1V rms 600 Ω
● Regulated Power Supply (0 ∿ ±15V)	Output Current	Higher than 1A
● Laser Power Checker	Wave Length Range Measurement Level Range Accuracy	0.8 ∿ 1.8 μm –40 ∿ +10 dBm ±5% ±1 digit
● Simple Encoder	Output	EFM Signal (TTL Level)
● DAD Monitor		
● PU Alignment Jig		

Alignment Jig Data

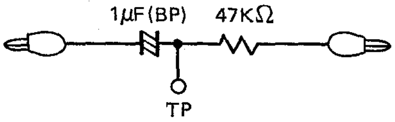
- ○ For encoder
  - 2P connector – BNC
  - 12P connector –Alligator clip x 2


SMK LP Connector
②
①
⑫
①
Shield Wire

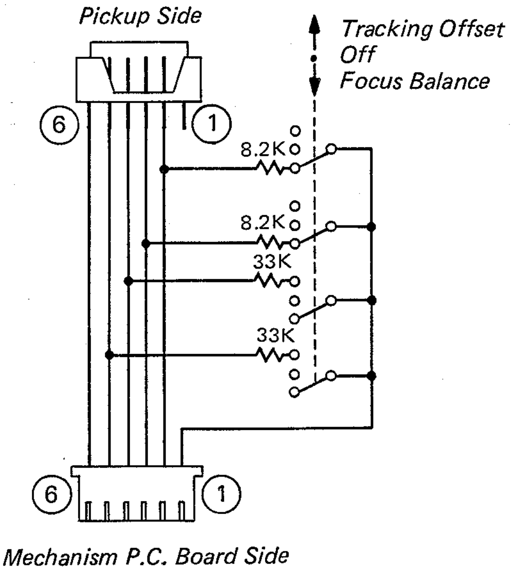
- ○ Servo gain Alignment
  - TEST DISC A
  - 1.8K, 3KHz Band pass filter UF-2BP-2 (NF)


IN
Shield Wire
GND
1
3
5
7
11
−15V
+15V
OUT
Shield Wire
GND
UP–2BP–2
24
22
21
19
18
16
15
13
82K
56K
Focus
Tracking

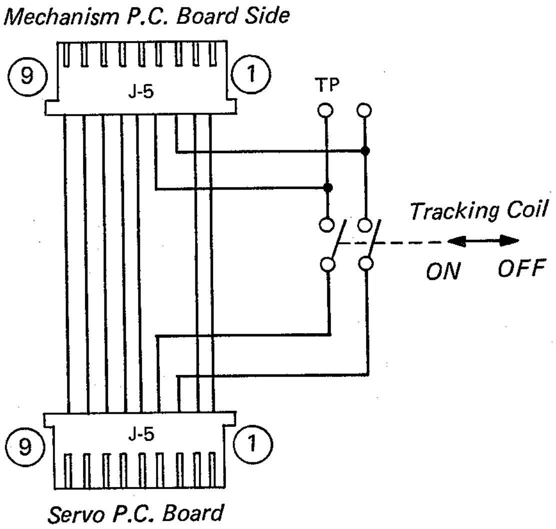
- ○ Focus Limit Alignment DISC
  - Disc with 0.9mm thickness spacer – DISC D


1μF(BP)
47KΩ
TP

○ Pick-Up Alignment
  - Servo Gain Alignment
  - PU Alignment Jig
  - J-2 Connector Jig


Pickup Side
Tracking Offset
Off
Focus Balance
⑥
①
8.2K
8.2K
33K
33K
⑥
①
Mechanism P.C. Board Side

- J-5 connector jig

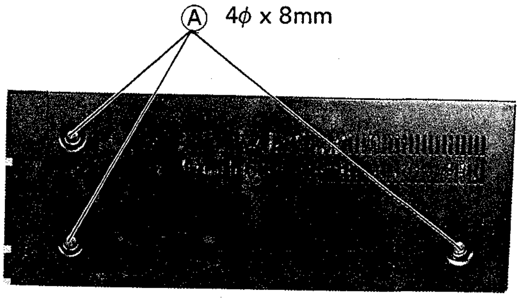

Mechanism P.C. Board Side
⑨
J-5
①
TP
Tracking Coil
ON
OFF
⑨
J-5
①
Servo P.C. Board

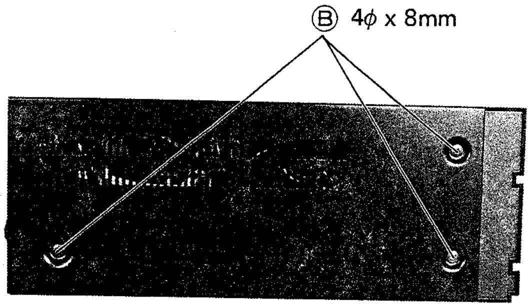
- TEST DISC A
- Polygram 400 088-2
- TEST DISC C
- Extension connector for Mecha. P.C.B.

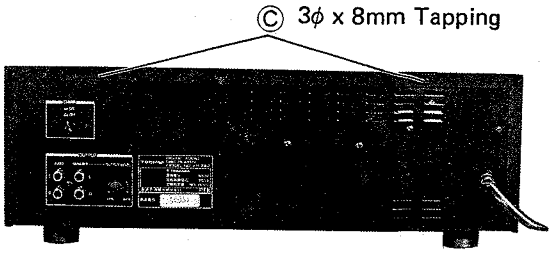
[17] DISASSEMBLY INSTRUCTIONS (CABINET)

TOP COVER REMOVAL

1. Remove six screws Ⓐ and Ⓑ (4φ x 8mm).
2. Remove two screws Ⓒ (3φ x 8mm) can be removed from the unit.

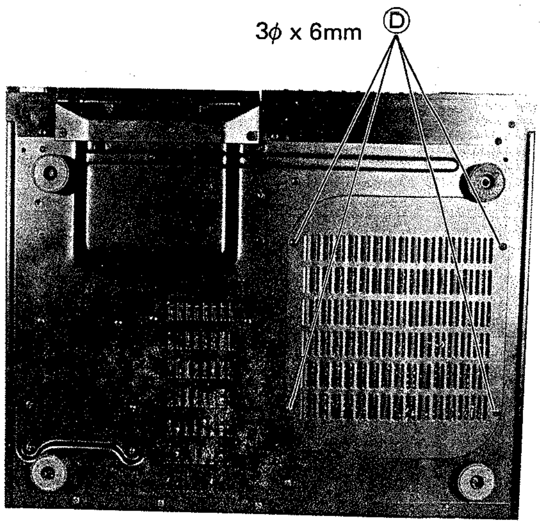





Ⓒ 3φ x 8mm Tapping

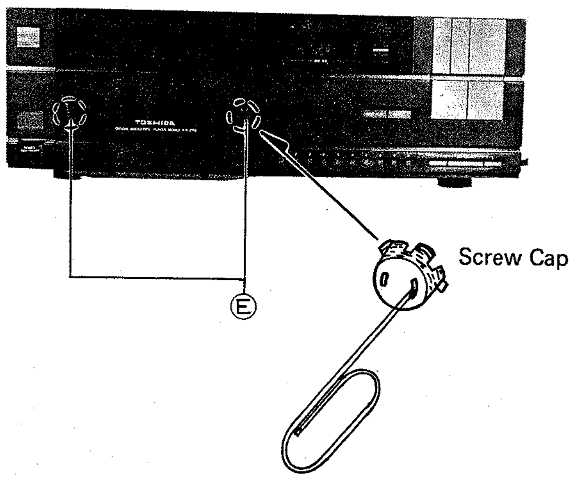
BOTTOM PLATE REMOVAL

1. Remove four screws Ⓓ (3φ x 6mm) can be removed from the unit.

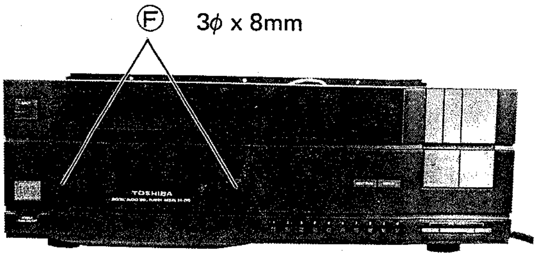


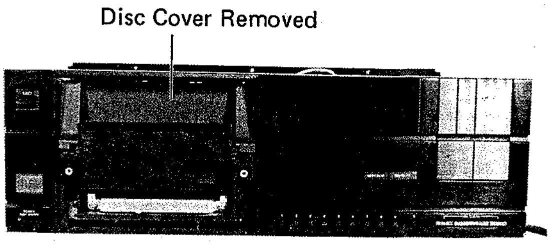
DISC COVER REMOVAL

1. Remove two screw caps Ⓔ. The cap can be removed easily by inserting a hook (made by bending an tip of clip, etc.) into the hole of the cap, and pulling the hook.
2. Remove two screws Ⓕ, and the disc cover will be removed.



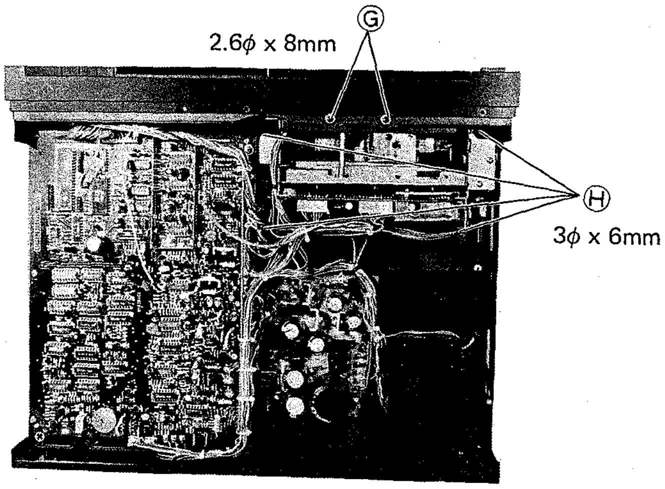
Clip (bend an end of clip by approx. 1mm)




Disc Cover Removed

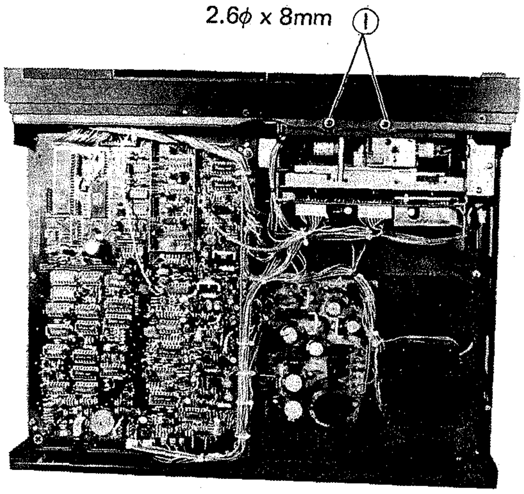
MECHA. ASS'Y REMOVAL

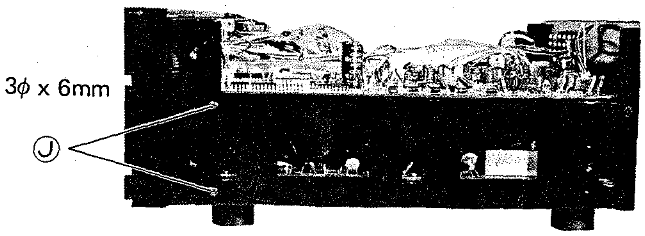
1. Remove disc cover.
2. Remove Mechanism securing six screws Ⓖ & Ⓗ, and the Mechanism assembly will be removed.

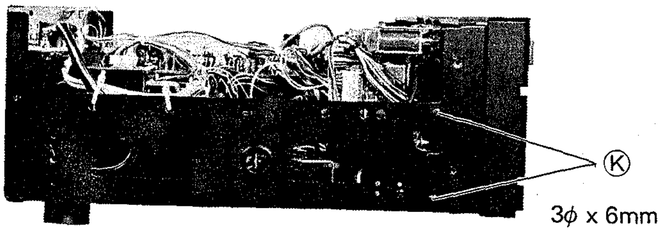

Ⓖ
2.6φ x 8mm
Ⓗ
3φ x 6mm

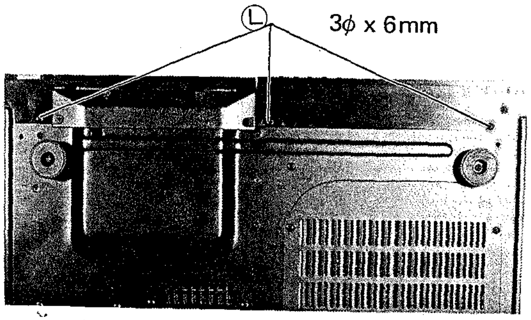
FRONT PANEL REMOVAL

1. Remove disc cover.
2. Remove nine screws Ⓘ, Ⓙ, Ⓚ and Ⓛ and the Front Panel will be removed.



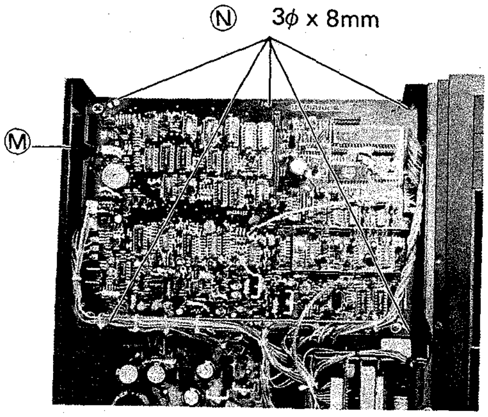


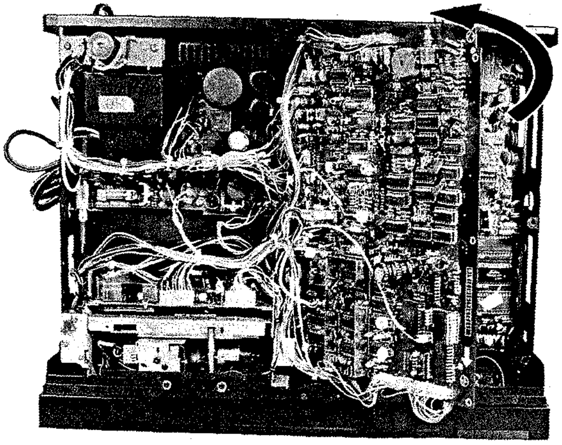




ACCESS TO SERVO P.C. BOARD

1. Remove one button Ⓜ.
2. Remove five screws Ⓝ and the P.C. Board can be opened.





[18] OUTLINE OF MECHANISM

1. PICKUP SLIDE MECHANISM

(1) When the wheel gear is rotated by the feed motor, the wire is pulled and the pickup is shifted thereby.

(2) The pickup is mounted on the pickup base. The pickup base is mounted on the slide rail. When the slide rail moves, the pickup also moves.
For smooth movement of the slide rail, rollers are inserted between the roller guide and slide rail.

2. EJECT MECHANISM

(1) At power off

When the eject button is pressed, the eject arm is pressed and moves the lock slider upwards. Then, the lock is released and the disc holder opens.

(2) At power off

- The solenoid Ⓐ is attracted and the eject arm slides and does not engage with the lock slider. When the eject button is pressed, the eject leaf switch turns on and the microcomputer receives the Y-signal. Then, the solenoid Ⓑ is attracted by an instruction from the microcomputer, and the solenoid arm moves upward, thereby actuating the lock slider to eject a disc loaded.
- The eject operation is performed in this way by the microcomputer instruction, because a time lag is need to make the eject operation after the disc rotation is completely stopped when the eject button is pressed while the disk is rotating.

3. DISC SET SENSOR AND TRACK SENSOR MECHANISM

(1) Disc set sensor

With the power turned on, the disc sensor (light emitting diode) emits test light and the light is reflected from a disc surface if it is loaded. The reflected light makes the phototransistor on. The phototransistor output is applied to the NOR gate of TC4001, the output of which informs the microcomputer whether the disc is loaded or not. Then, the operation proceeds to next step.

(2) Disc tack sensor

The disc tack sensor detects light reflection from the reflection label (monochrome) attached on the disc motor shaft to detect disc motor speed.

4. START LIMIT SWITCH AND END LIMIT SWITCH

(1) With no disc loaded, the pickup is usually at the fixed position on the most inner circumference. The start limit switch detects this position.

(2) A lead-out signal is recorded after a last piece of music on a disc. Detecting this signal, the pickup returns to the start position and stops with pause mode set. If the lead-out signal is not read by the pickup, the pickup stays on the outer circumference.
To prevent such a stay of the pickup, the mechanical end limit switch is provided.

5. DOOR LOCK LEAF SWITCH

When a disc is loaded, the disc set sensor detects it and informs the microcomputer that a disc has been loaded. At the same time the door lock switch is pushed by the switch lever which is also actuated by the disc loading operation. The leaf switch consists of two circuits: one is inserted in series with the (–) B power supply for laser diode and the other in series with the control signal from the microcomputer.

[19] OPERATION OF MECHANISM

1. EJECT

(1) Fig. 19-1 shows initial steps of the eject operation. When the eject button is pressed, the eject arm (76) is pushed in a direction shown by an arrow ⓐ, then the lock slider ㊿ slides upward ⓑ, and this makes hooks of the lock slider and the disc holder ㊸ release.

(2) Fig. 19-2 shows a process of the eject operation being proceeded. The disc holders ㊸ and ⑩ move in a direction shown by the arrow. At the same time, front section of the disk support ㉞ rises gradually in the arrow direction ⓓ as shown in Fig. 19-2.

(3) Operation of the leaf switch
The eject leaf switch (65) opens while the disc holder is being locked, and closes immediately when the eject arm (76) is operated. The door lock leaf switch (90) turns on when locked, and off when ejected.
* Eject leaf switch: senses eject operation
* Door lock switch: senses conditions of door opened or closed

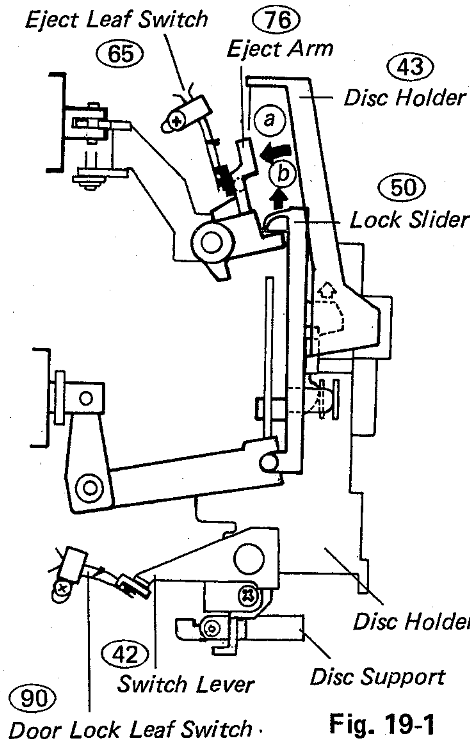

Eject Leaf Switch
(65)
(76)
Eject Arm
㊸
Disc Holder Ⓑ
ⓐ
ⓑ
㊿
Lock Slider
Disc Holder Ⓐ
㊷
Switch Lever
Disc Support
(90)
Door Lock Leaf Switch

Fig. 19-1

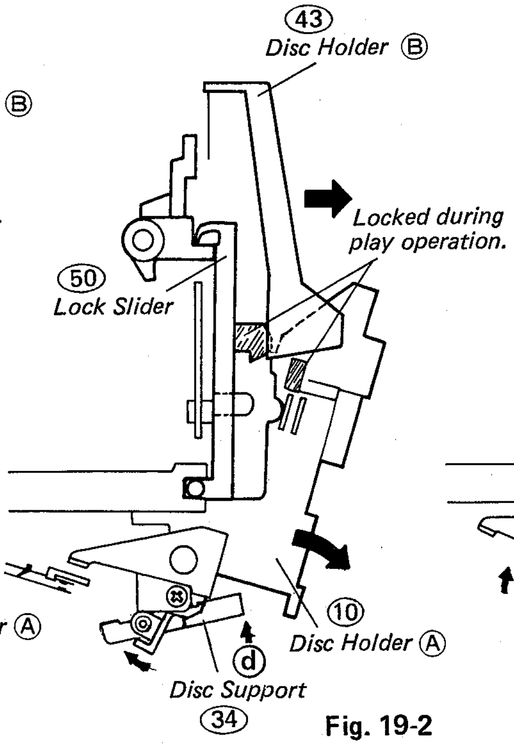

㊸
Disc Holder Ⓑ
Locked during play operation.
㊿
Lock Slider
⑩
Disc Holder Ⓐ
ⓓ
Disc Support
㉞

Fig. 19-2

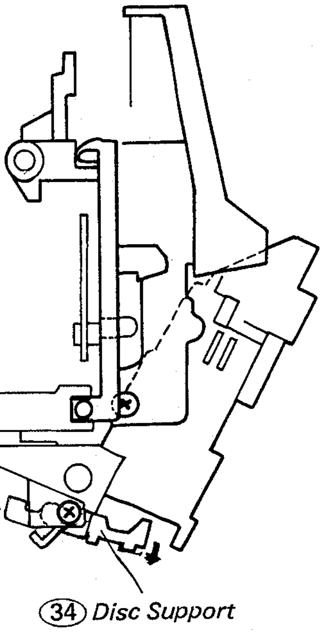

㉞ Disc Support

Fig. 19-3

Eject operation immediately after the eject button is pushed. ⟶ *On way of eject operation.* ⟶ *Eject operation completed.*

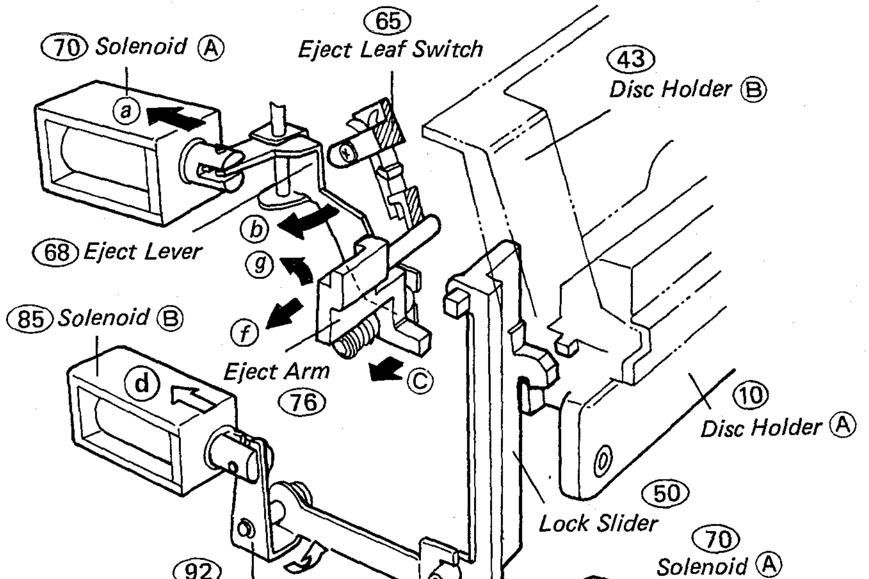
2. EJECT OPERATION WITH POWER ON (Fig. 19-4)

(1) When the power is turned on, the solenoid Ⓐ(70) starts continuous operation. Then, the iron core of the solenoid Ⓐ is attracted in the arrow a direction, and this makes the eject lever (68) move in the arrow ⓑ direction, then eject arm (76) slides in the arrow ⓕ direction, thereby setting both eject arm and lock slider to the position not engaging each other.

(2) Under this condition, when the eject arm (76) is pushed in the direction, shown by the arrow ⓖ, it turns on the eject leaf switch (65) being set to the open state and allows a signal to pass to the microcomputer. By this signal, the microcomputer send instructions to return the pickup to the inner circumference and to stop the disc motor. After the motor is stopped, the solenoid Ⓑ(85) operates, thereby the solenoid arm (92) and lock slider (50) are attracted to complete the eject operation.

3. EJECT OPERATION WITH POWER OFF (Fig. 19-5)

When the eject button is pressed, the eject arm (76) is pushed in the arrow ⓐ direction, and the lock slider (50) moves in the arrow ⓑ direction, then the lock is released thereby the disc holder opens to cause the eject operation.


(70) Solenoid Ⓐ
(65) Eject Leaf Switch
(43) Disc Holder Ⓑ
ⓐ
ⓑ
(68) Eject Lever
ⓖ
(85) Solenoid Ⓑ
ⓕ
ⓓ
Eject Arm
(76)
ⓒ
(10) Disc Holder Ⓐ
(50) Lock Slider
(92) Solenoid Arm
ⓔ

Eject operation with power turned on.

Fig. 19-4

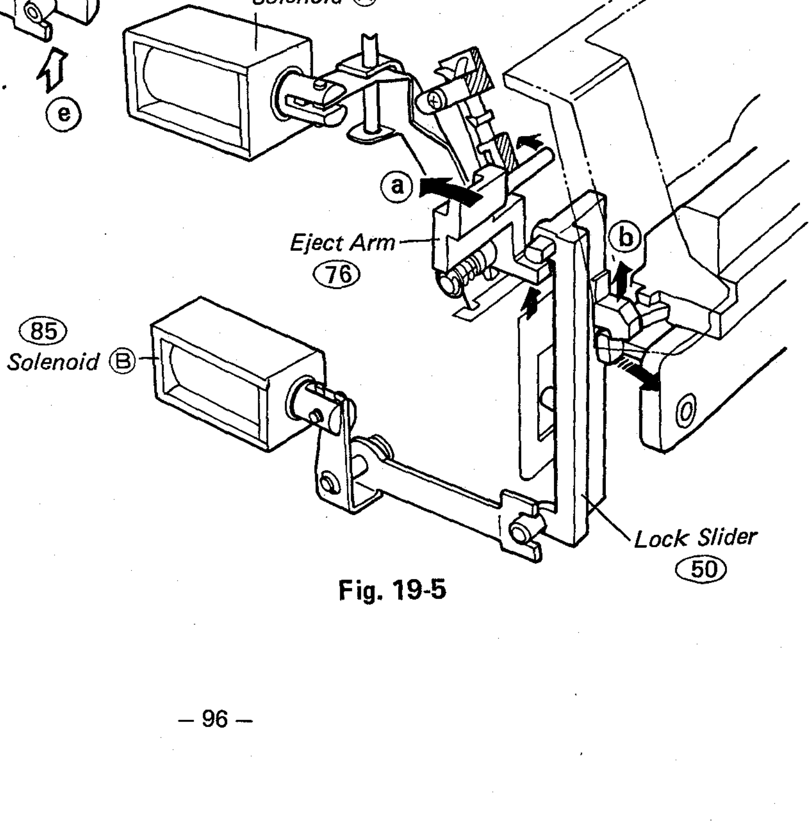

(70) Solenoid Ⓐ
ⓐ
Eject Arm
(76)
ⓑ
(85) Solenoid Ⓑ
Lock Slider
(50)

Fig. 19-5

4. LOADING OPERATION WITH DISC SET (Fig. 19-6)

(1) In the drawing of the mechanism seen from the front, the clamper assembly and clamp lever ⑯ are contained in the disc holder Ⓐ ⑩. When a disc is load in the disc holder Ⓐ ⑩ by hand, each part moves in the arrow direction.

(2) The clamper assembly and clamp holding spring ㉖ incorporated in the clamp lever ⑯ are used to let a disc be smoothly clamped on the disc receptacle, and work to push the disc at clamping.
Each disk support moves in the arrow direction from the halfway of loading.

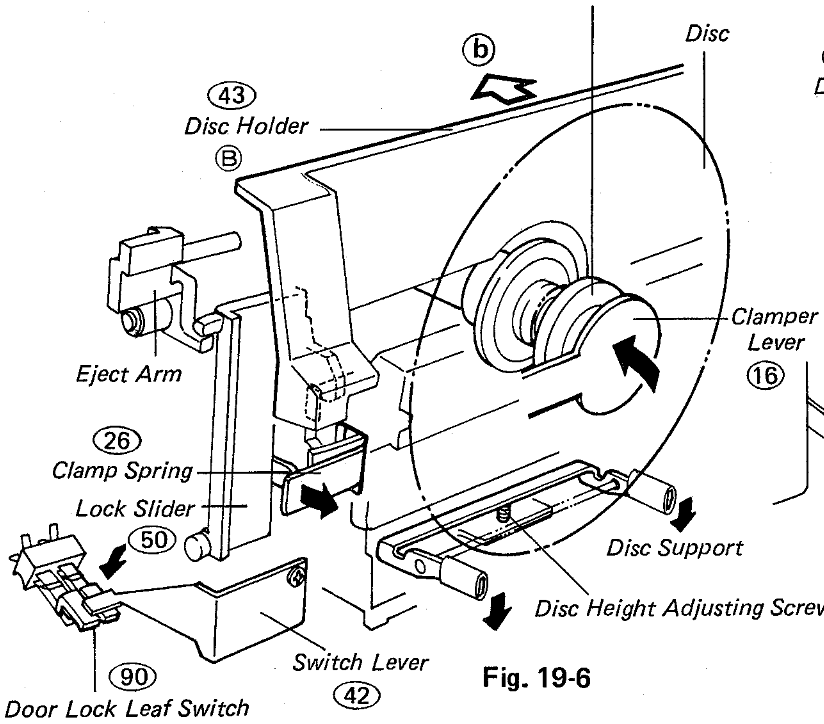


Fig. 19-6

Disc Loading Operation

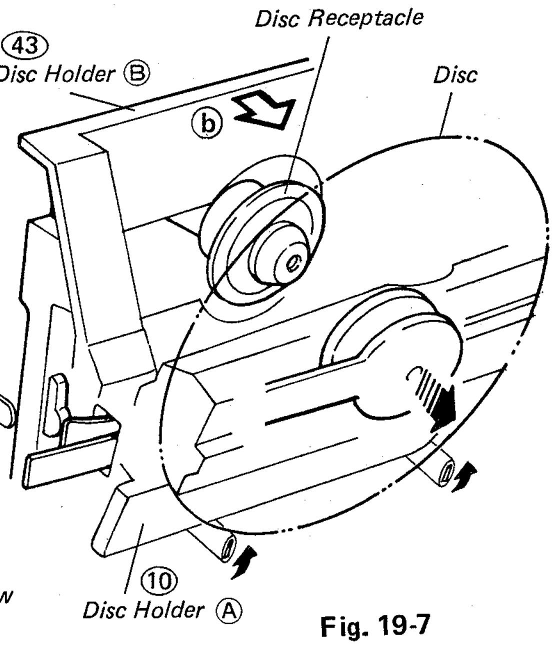


Fig. 19-7

Disc Eject Operation

5. DISC EJECT OPERATION (Fig. 19-7)

When a disc is ejected, the disc holder ㊸ moves in the arrow direction as shown in Fig. 19-7. The disc in the disc holder Ⓐ ⑩ is pushed by the disc holder Ⓑ and moves in the same direction. Then, the disc loaded in the disc receptacle is pushed out.

- Immediately after a disc is ejected, the disc support moves in the arrow ⓑ direction.

6. PICKUP SLIDING OPERATION

(1) Rotation of the feed motor (160) is transmitted to the belt (161) to rotate the bearing unit assembly (158). The bearing unit rotation moves the worm gear (158) and worm wheel gear (146) in the arrow direction. These gears' operation moves the pickup linearly through the wire rope assembly (143) connected to the mechanism damper assembly (141).

(2) One end of the wire rope assembly (143) is fixed to the wire mount assembly (174), and the other end fixed to the wire mount assembly through the wire spring (144).

(3) To move the slide rail (188) smoothly, it is pressed to the pressing rail (203) with appropriate pressure by means of two upper and lower pressing rails (203) and two pairs of roller guide assemblies 157 (1 roller guide plus 4 rollers). The motion of the slide rail (188) is transmitted to the reduction gear (106) and three intermediate gears (214) when the rack gear (197) connected to the slide rail (188) moves in the arrow direction, and the roller guide assembly (157) on both sides moves in the arrow direction.

(4) To move the pickup (167) in the arrow direction, the above (1) and (3) should take place at the same time, and its driving power should be generated in the step (1).

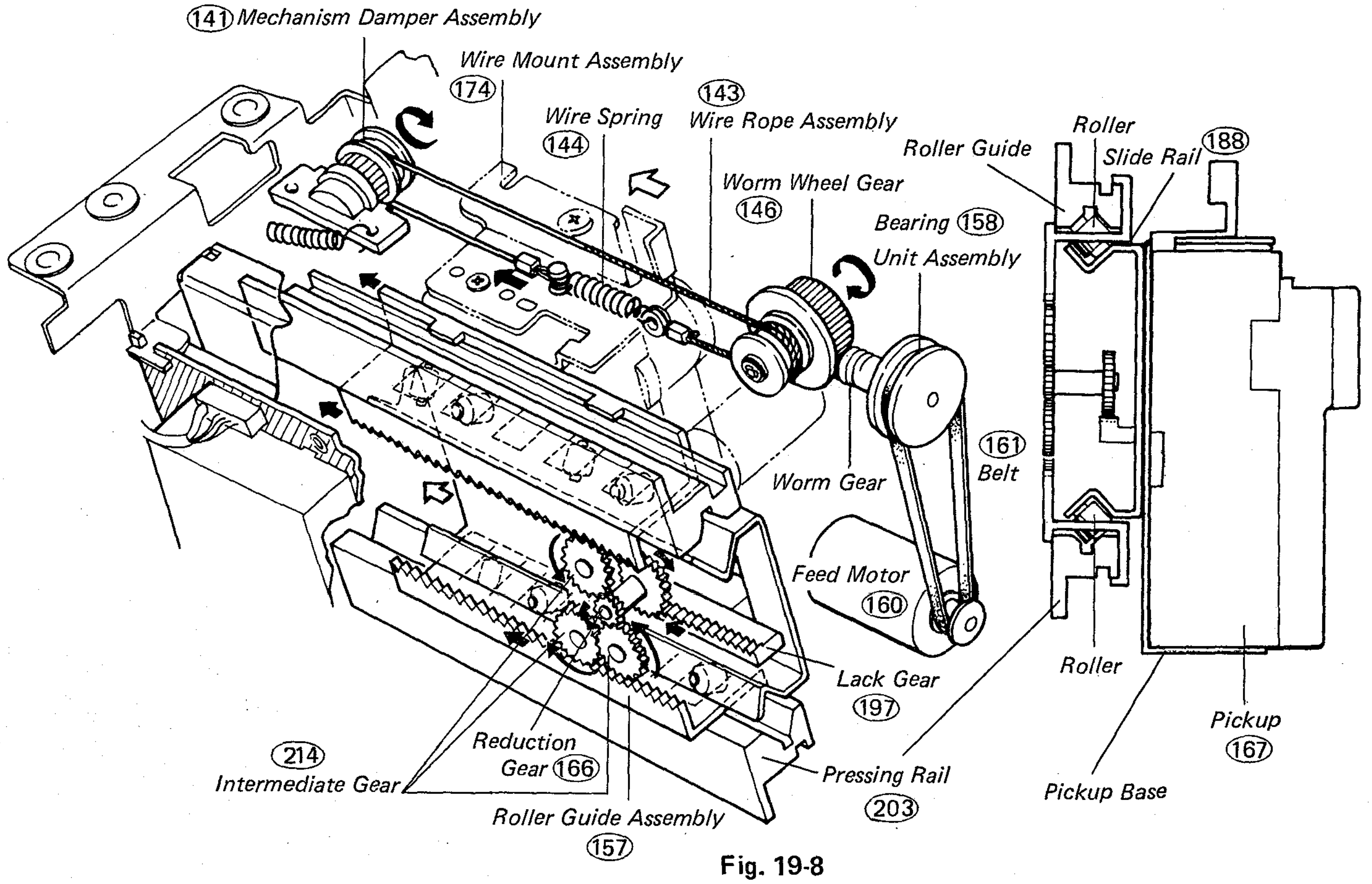

⑭① Mechanism Damper Assembly
Wire Mount Assembly
⑰④
⑭③
Wire Spring
Wire Rope Assembly
⑭④
Roller
Roller Guide
Slide Rail
⑱⑧
Worm Wheel Gear
⑭⑥
Bearing ⑮⑧
Unit Assembly
⑯① Belt
Worm Gear
Feed Motor
⑯⓪
Lack Gear
⑲⑦
Roller
Pickup
⑯⑦
②①④
Intermediate Gear
Reduction Gear ⑯⑥
Pressing Rail
⑳③
Pickup Base
Roller Guide Assembly
⑮⑦

Fig. 19-8

7. OPERATIONS OF DISC SET SENSOR AND DISC TACK SENSOR

Fig. 19-9 shows mounting positions for the sensors. Refer to the electric circuit description for details.

(1) The disc set sensor is mounted in the mechanism chassis to detect existence of disc.

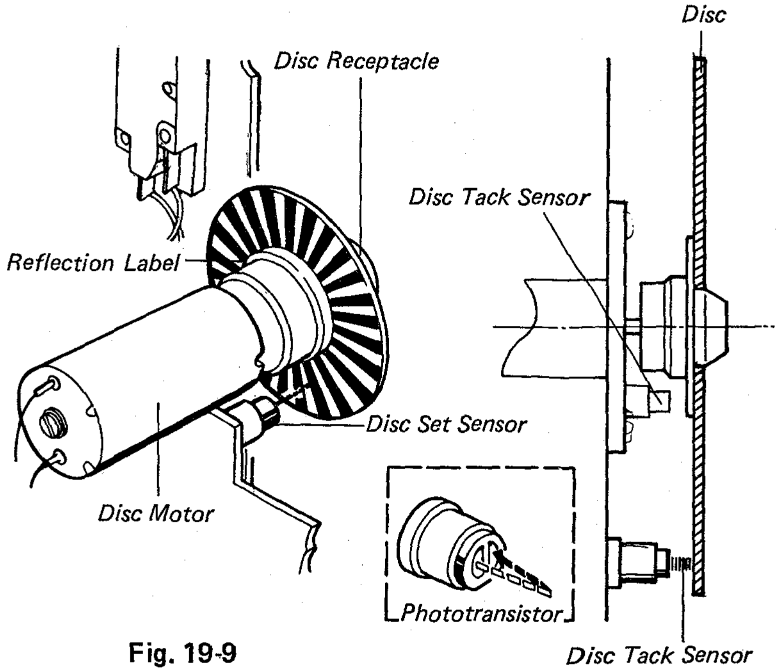

Disc
Disc Receptacle
Disc Tack Sensor
Reflection Label
Disc Set Sensor
Disc Motor
Phototransistor
Disc Tack Sensor

Fig. 19-9

(2) The disc tack sensor is mounted on the P.C.B. of the mechanism chassis to detect light and darkness (black and white) of the reflection label attached to the backside of the disc receptacle for controlling the motor speed at its starting operation when the servo is not effected by the disc signal.

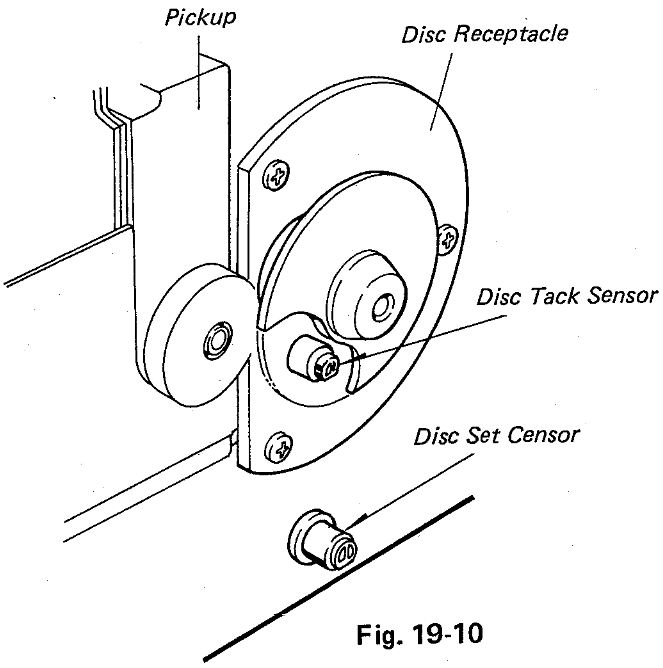

Pickup
Disc Receptacle
Disc Tack Sensor
Disc Set Censor

Fig. 19-10

Mounting Location of Each Sensor

8. OPERATIONS OF START AND END LIMIT SWITCHES

(1) Start limit switch (Fig. 19-11)

- The microswitch adjsuting plate is mounted on the mount pick (184), and adjusted with the start position adjusting screw (202). When the pickup assembly moves inward, the start limit microswitch (152) is pushed by the microswitch adjusting plate and the pickup stops.
- The pickup start position can be changed by turning the start position adjusting screw (202). (Turn the screw clockwise to move the pickup inward.)

(2) End limit switch (Fig. 19-12)
When the protruding section of the wire mount assembly (174) mounted on the mount pick (184) is moved to the outside of disc periphery by the pickup feed mechanism, the end limit leaf switch (139) provided in the mechanism chassis is pushed and motion of the pickup is stopped.

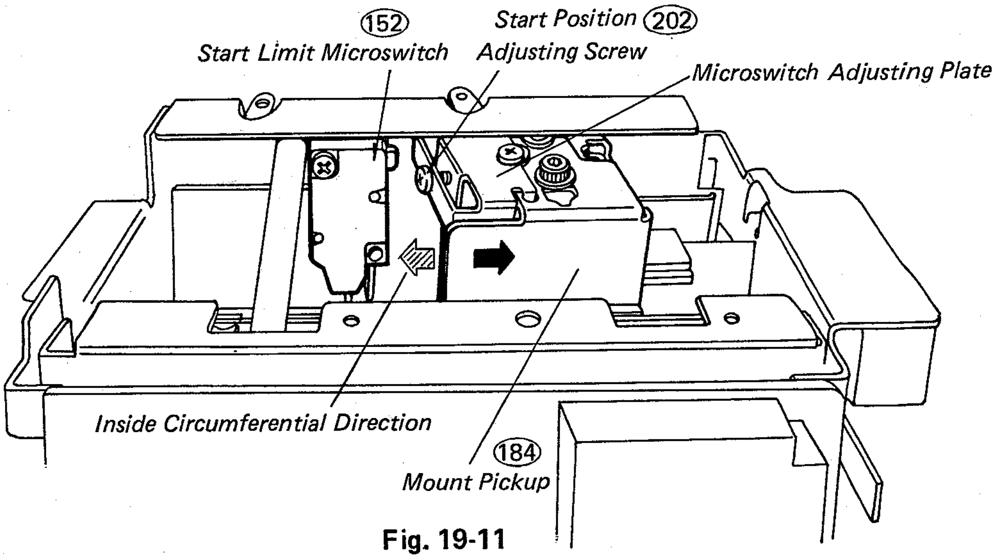

(152)
Start Limit Microswitch
Start Position (202)
Adjusting Screw
Microswitch Adjusting Plate
Inside Circumferential Direction
(184)
Mount Pickup

Fig. 19-11

Start Limit Switch

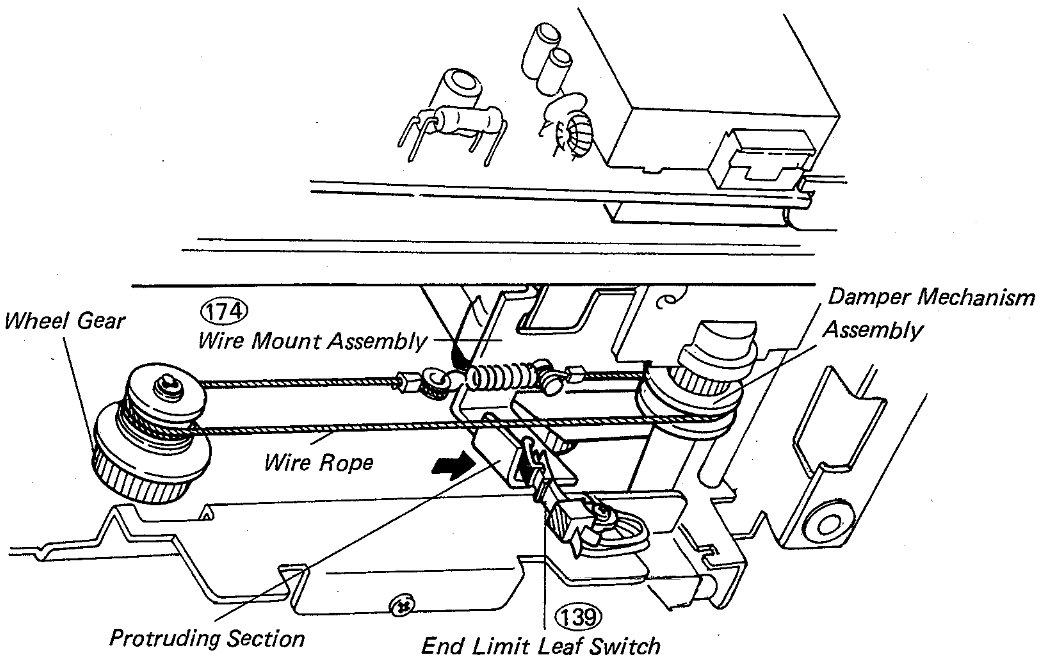

Wheel Gear
(174)
Wire Mount Assembly
Damper Mechanism Assembly
Wire Rope
Protruding Section
(139)
End Limit Leaf Switch

Fig. 19-12

[20] REPLACEMENT OF PRIMARY PARTS

1. PICKUP

(1) Remove the disc holder as shown in Fig. 20-4.

(2) Insert the short-circuit jumper (metal fitting) to the pick-up as shown in Fig. 20-3. Or, short-circuit red and black terminals with a lead wire as shown in Fig. 20-4.
Note: Always remove lead wires after completion of the short-circuit.

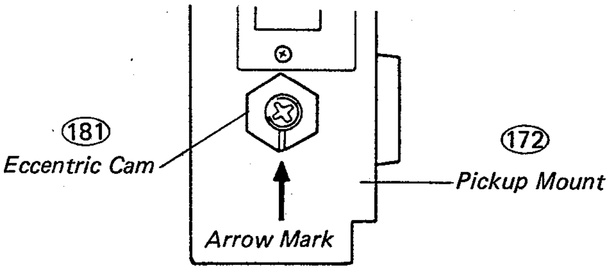
(3) Remove 5-pin and 4-pin connectors of the pickup, and remove three wire leads soldered.
Note: Use a soldering iron with a grounding wire. Ground the mechanism chassis too. (Grounding is also necessary in the case of ceramic soldering iron.)
Before replacing the pickup, the repairman should discharge the static electricity of his body or ground the body.

(4) Remove the pickup nameplate securing screw(147) (2.6ϕ x 6mm) and remove the nameplate.

(5) Remove the special screw (185) (3ϕ x 6mm) and set-screws (183) (3ϕ x 12mm), (182), (181) and (180). Then the pickup comes off.

(6) Do the avobe procedures in the reverse order for re-assembling.

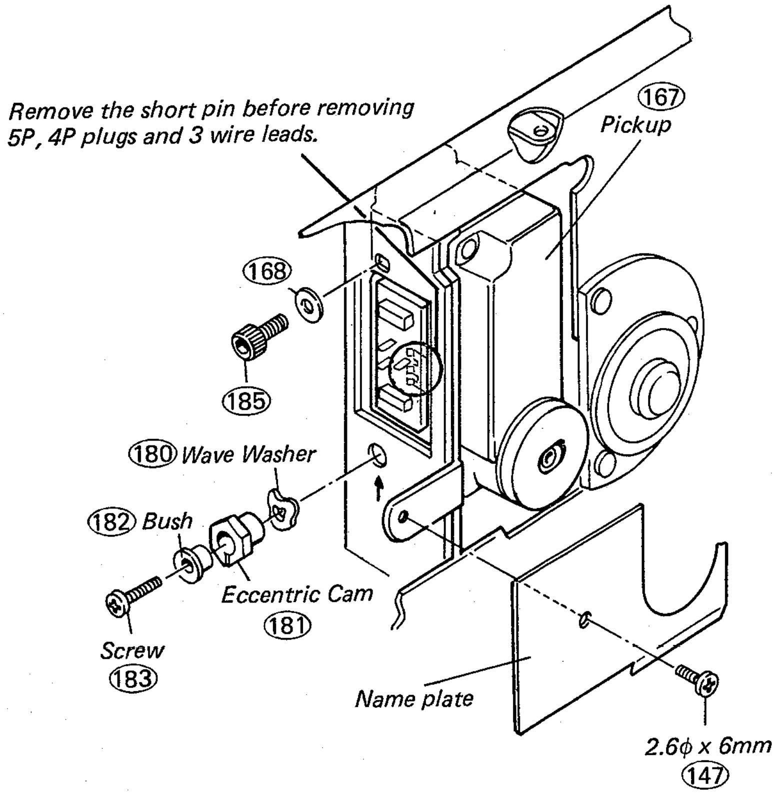
(7) At re-assembling, the eccentric cam (181) shown in Fig. 20-2 should be adjusted so that the its groove is aligned with the arrow mark " ↑ " of the pickup mount(174).


(181)
Eccentric Cam
(172)
Pickup Mount
Arrow Mark

Note 1: Do not forget to remove the short pin from the new pickup after the 4P and 5P plugs have been connected and three wire leads have been soldered.

Note 2: Do not touch the lens of the pickup by your hand.

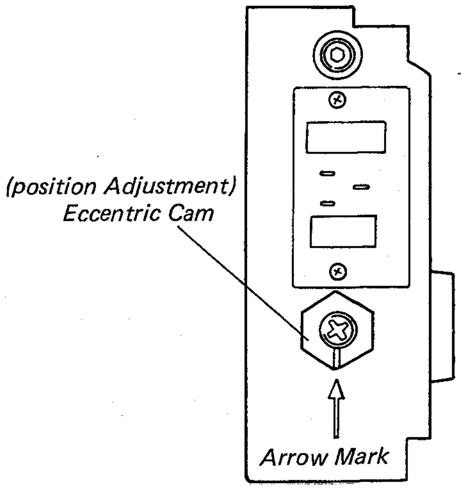
Note 3: After replacing the pickup, make re-adjustment according to the manual [14-1] ~ [14-6].



Remove the short pin before removing 5P, 4P plugs and 3 wire leads.

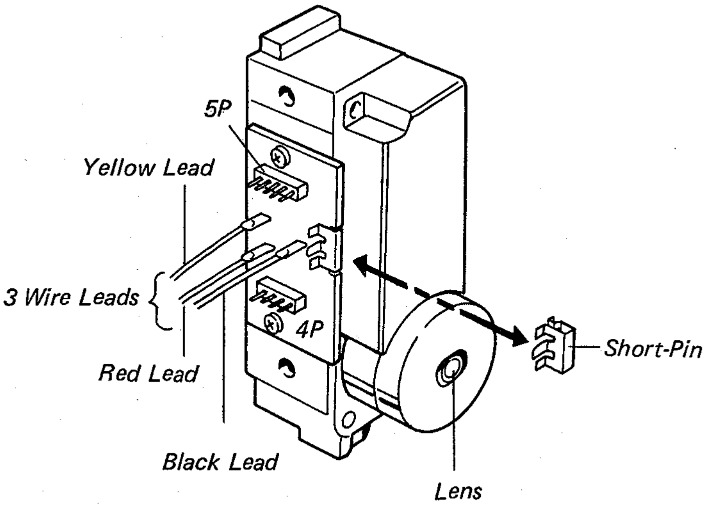
(167)
Pickup
(168)
(185)
(180) Wave Washer
(182) Bush
Eccentric Cam
(181)
Screw
(183)
Name plate
2.6ϕ x 6mm
(147)

Fig. 20-1



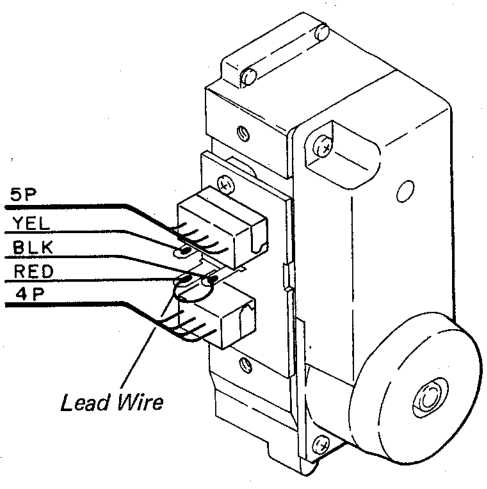
(position Adjustment)
Eccentric Cam
Arrow Mark

Fig. 20-2



5P
Yellow Lead
3 Wire Leads
Red Lead
Black Lead
4P
Short-Pin
Lens

Fig. 20-3



5P
YEL
BLK
RED
4P
Lead Wire

Fig. 20-4

2. MAIN MOTOR

(1) Remove disc holder Ⓐ securing screws ㊽ (2.6φ x 12mm) and ㊹ (2.6φ x 6mm).

(2) Remove eject holder spring (123) and special set-screw (124). Move disc holders Ⓐ and Ⓑ forward and remove then. At this time, note how to mount the door spring ㊻ for later reference.

(3) Remove three screws (127) (2.6φ x 6mm) securing main motor and motor lead wires by using a soldering iron. Then, the main motor can be replaced.

(4) Use reverse procedures when reassembling.

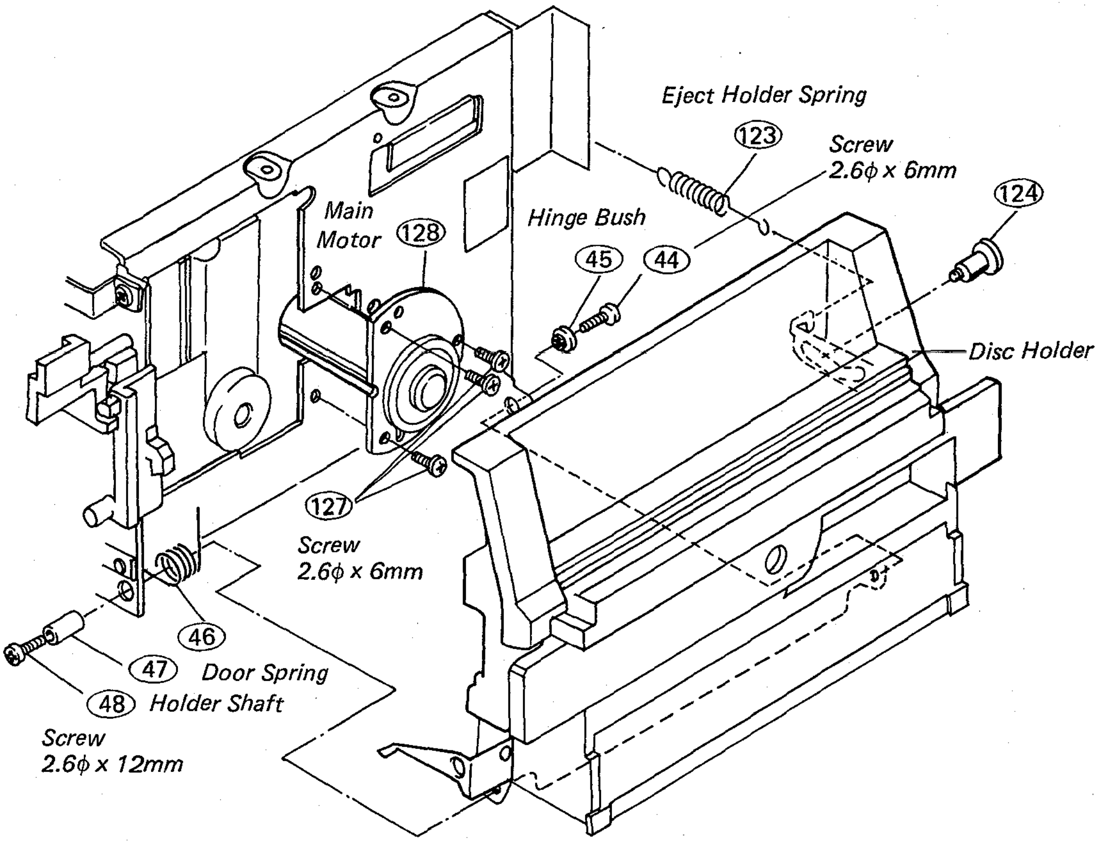

Eject Holder Spring
(123)
Screw
2.6φ x 6mm
(124)
Main
Motor
(128)
Hinge Bush
㊺
㊹
Disc Holder
(127)
Screw
2.6φ x 6mm
㊻
㊼ Door Spring
㊽ Holder Shaft
Screw
2.6φ x 12mm

Fig. 20-5

3. FEED MOTOR

(1) Insert a screwdriver into an opening provided on right side of the mechanism as shown in Fig. 20-6, and remove two screws (132) (2φ x 4mm) feed motor.

(2) Remove the belt and motor wire leads. Then, the feed motor can be easily replaced shown in Fig. 20-7.

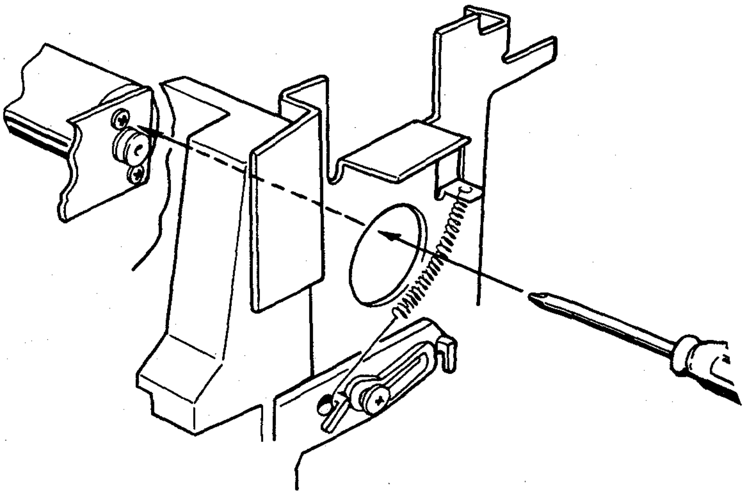


Fig. 20-6

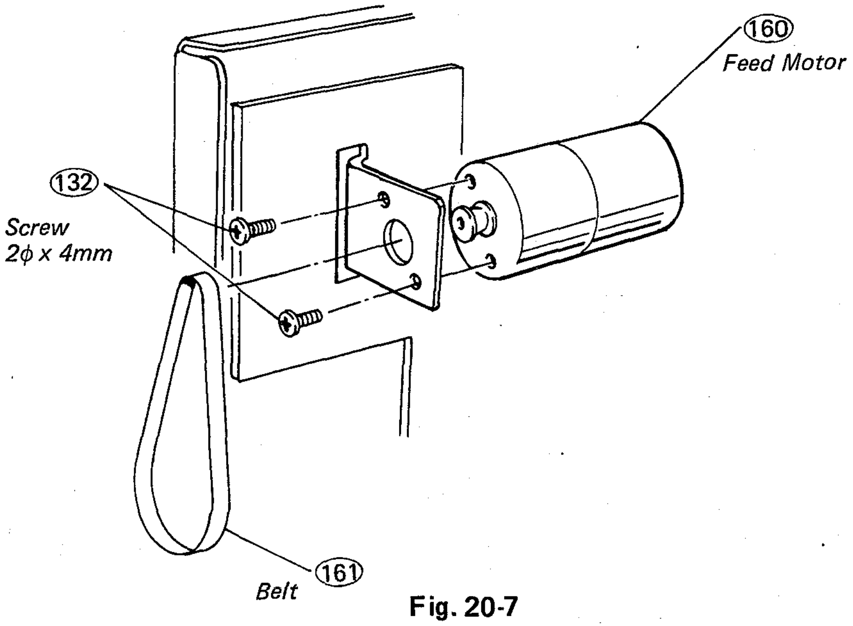

(160)
Feed Motor
(132)
Screw
2φ x 4mm
Belt
(161)

Fig. 20-7

4. CHECK AND REPLACEMENT OF SLIDE RAIL AND ROLLER GUIDE

Check the slide rail and roller guide when they move unsmoothly or with rattling.

Disassembly procedure

(1) Remove disc holder securing screw ㊽ , holder shaft ㊼ and door spring ㊻ . Remove set-screw ㊹ and hinge bush ㊺ .

(2) Remove special screw (124) and take off eject holder spring (123). Then, the disc holder comes off.

(3) Remove four screws (52) securing left side of chassis shown in Fig. 20-9.

Note: Remove four screws (107) securing right side of chassis. Remove two screws (97) securing P.C.B. of the mechanism.

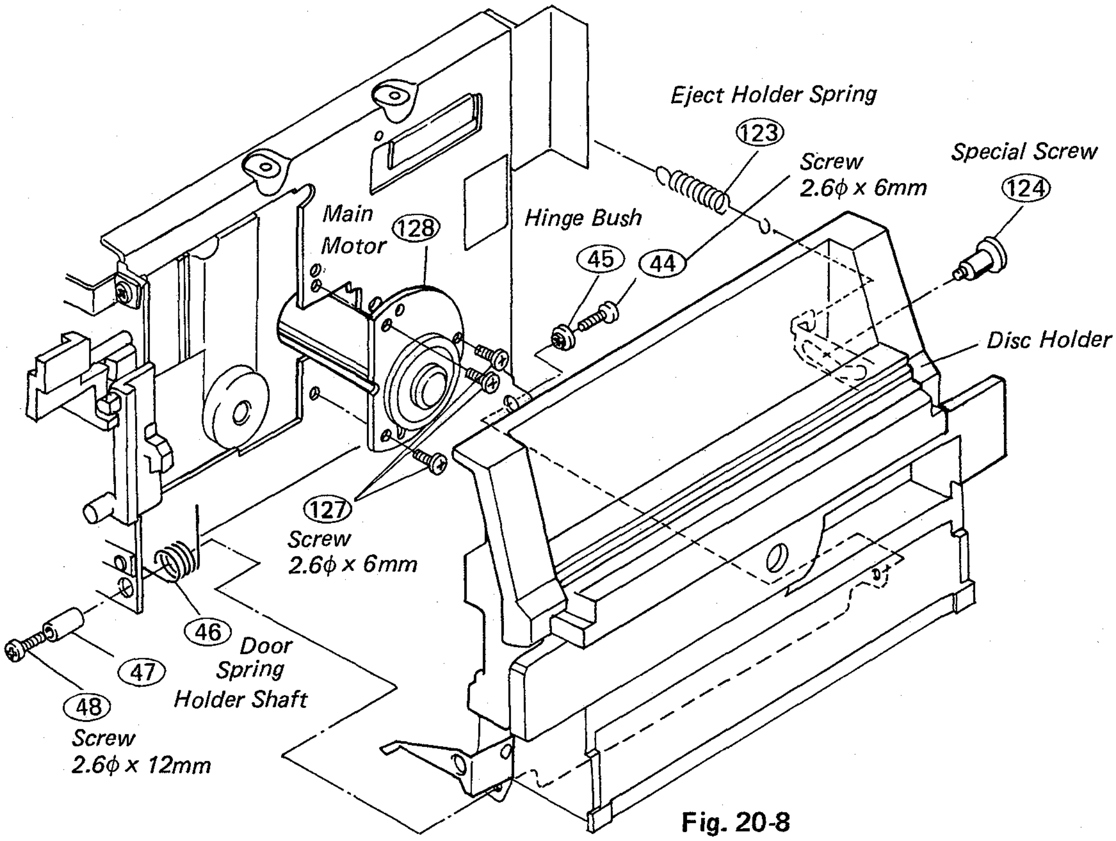

Eject Holder Spring
(123)
Screw
2.6φ x 6mm
Special Screw
(124)
Main
Motor
(128)
Hinge Bush
㊺
㊹
Disc Holder
(127)
Screw
2.6φ x 6mm
㊻
Door
Spring
㊼
Holder Shaft
㊽
Screw
2.6φ x 12mm

Fig. 20-8

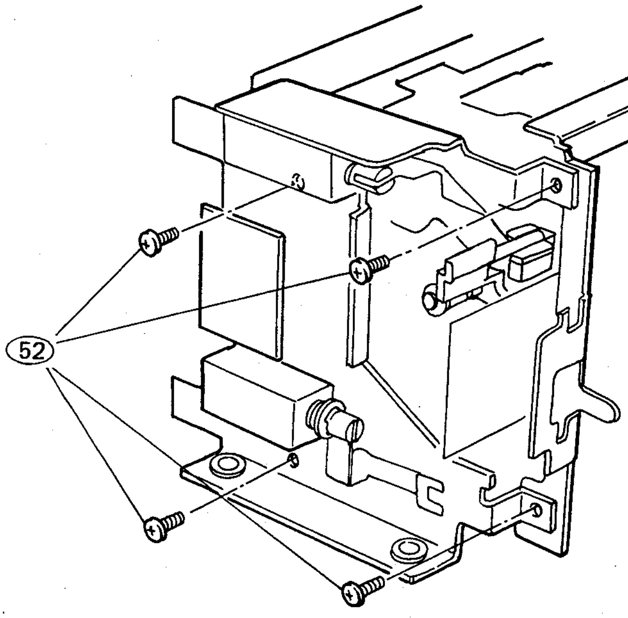


Fig. 20-9

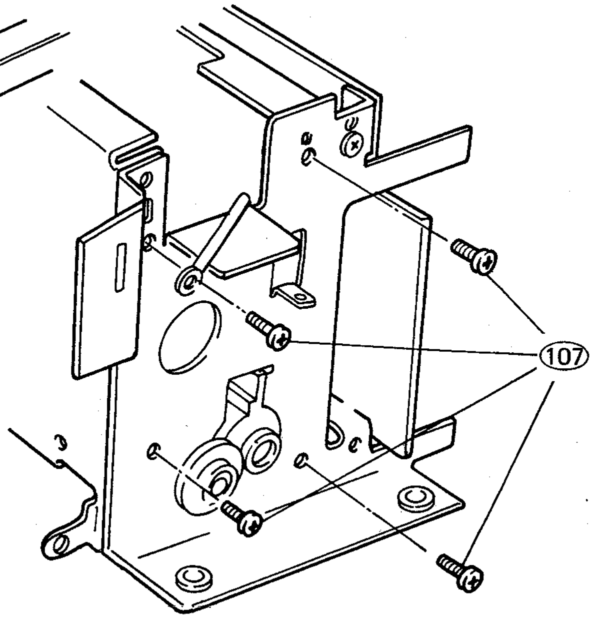


Fig. 20-10

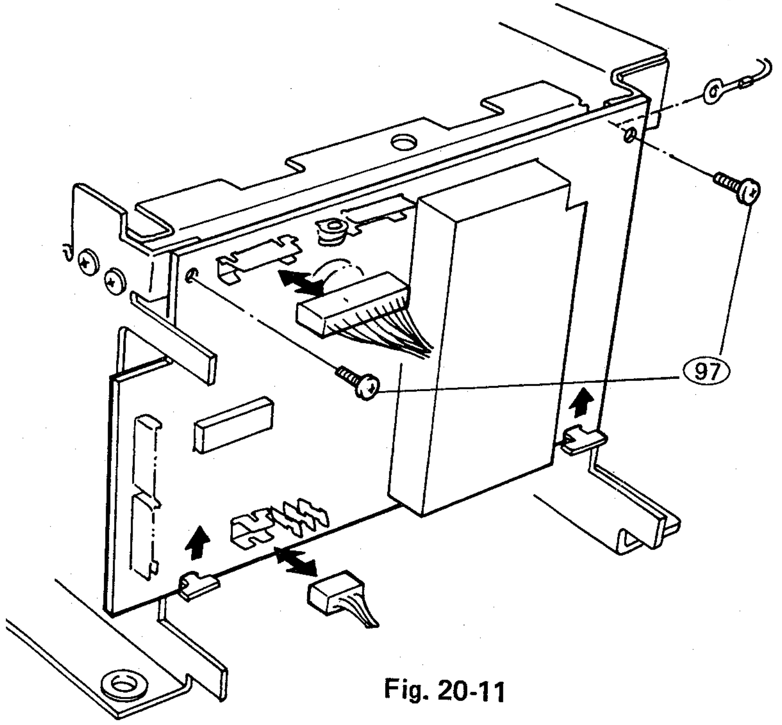


Fig. 20-11

(4) Remove three screws (130) securing main chassis (131). Take off the dumper spring (144) and move the pickup. Remove the screw (176) fixing the wire mounting plate (174). Then, the main chassis (131) comes off.

(5) Remove screws (191) and (210) securing the rail holding springs (192) and (211), and take off the springs.

(6) Remove the screw (216) securing the gear lever assembly (215) on the back of the mechanism chassis, and take off the gear lever assembly.

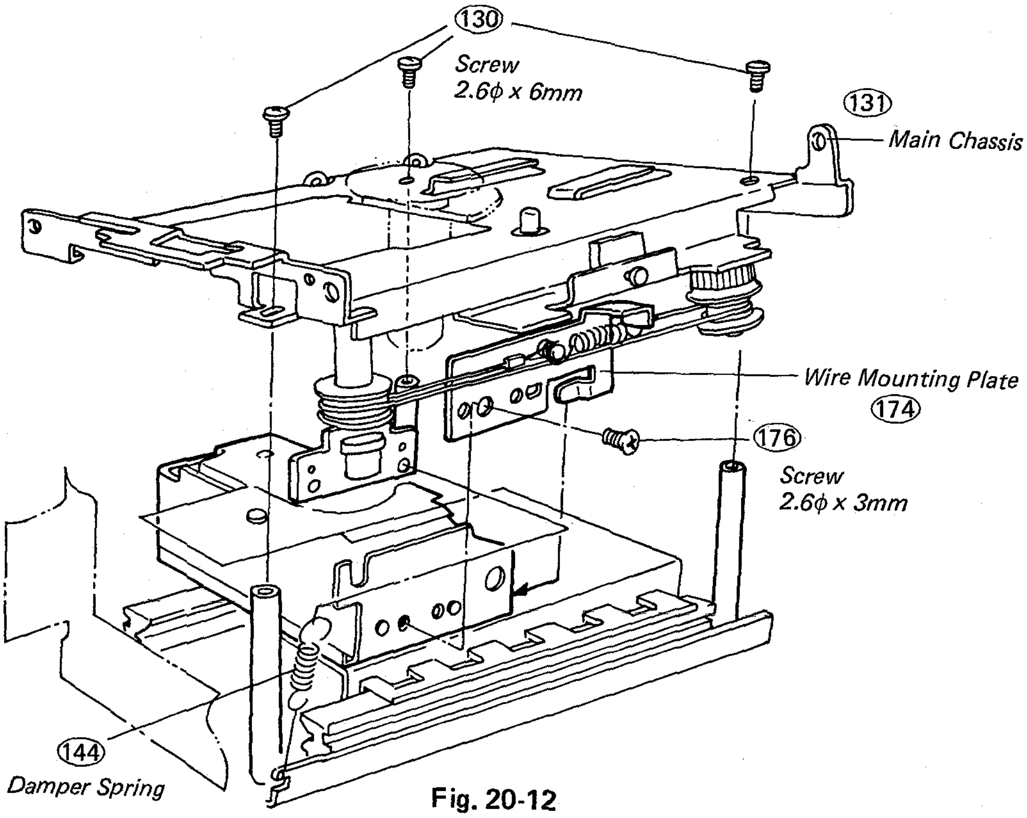

130
Screw
2.6φ x 6mm
131
Main Chassis
Wire Mounting Plate
174
176
Screw
2.6φ x 3mm
144
Damper Spring

Fig. 20-12

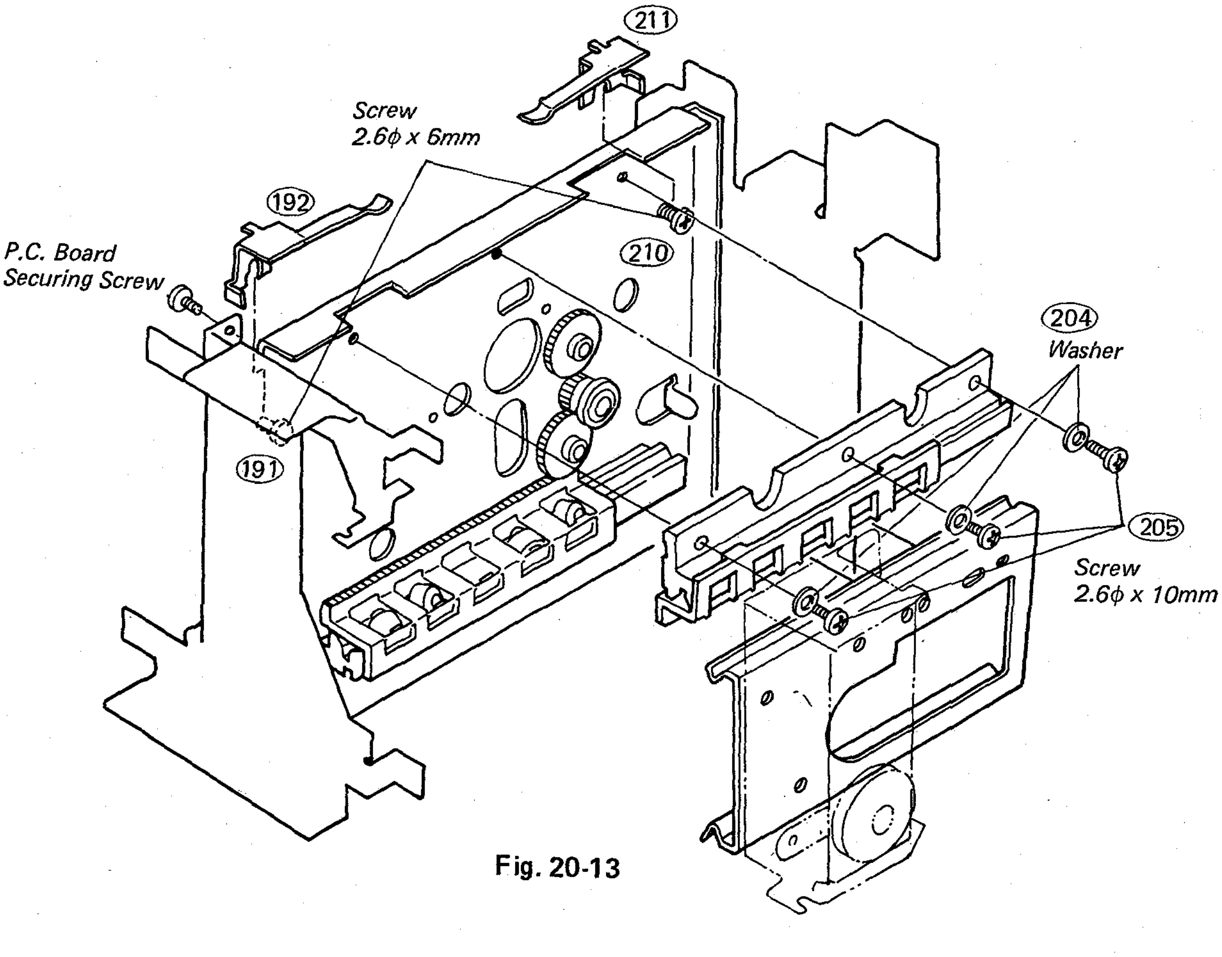

211
Screw
2.6φ x 6mm
192
P.C. Board
Securing Screw
210
204
Washer
191
205
Screw
2.6φ x 10mm

Fig. 20-13

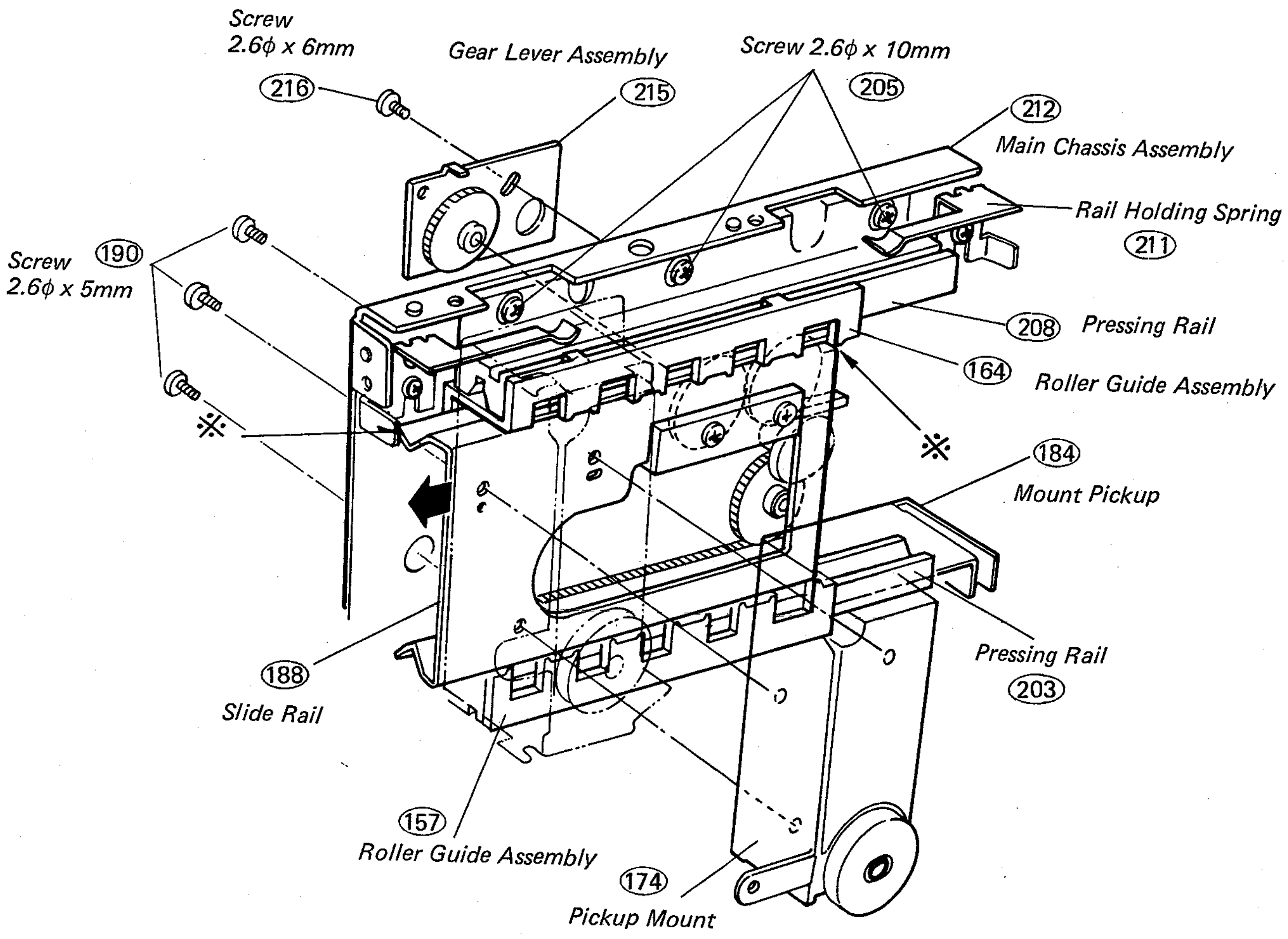

Screw
2.6φ x 6mm
(216)
Gear Lever Assembly
(215)
Screw 2.6φ x 10mm
(205)
(212)
Main Chassis Assembly
Rail Holding Spring
(211)
Screw (190)
2.6φ x 5mm
※
(208) Pressing Rail
(164) Roller Guide Assembly
※
(184)
Mount Pickup
Pressing Rail
(203)
(188)
Slide Rail
(157)
Roller Guide Assembly
(174)
Pickup Mount

Fig. 20-14

(7) Remove three screws (205) and washer (204) securing the pressing rail. Then, the slide rail (188) and roller guide assemblies (157) and (164) come off.
- Replace the intermediate gear at this time if it is necessary.

(8) The lower pressing rail (203) and roller guide (157) can be taken off by removing three screws (168).

(9) Take off the damper gear shown in Fig. 20-16 by removing the E-ring (112).

Assembling

Assembling procedures are usually reverse from those in disassembling but in this mechanism they will be somewhat different. Accordingly, follow the following procedures.

(1) Insert the roller guides (157) and (164) into the pressing rails (203) and (208), and first mount the pressing rail (203) on the lower side.

(2) Put the holding spring (208) in the specified position. Tighten the slide rail (188) tentatively with the screw (205) between upper and lower roller guides, and insert it from the left side.

(3) Mount the rail holding springs (192) and (211). Move the pickup (slide rail) until it reaches the left stopper. Adjust the roller guides (157) and (164) to the right position marked "※" as shown in the drawing.

(4) Mount the damp gear and fix it with the E-ring, (112) shown in Fig. 20-16.

(5) Loosen the screw (205) which is tighten temporarily to scure the pressing rail (208), and then re-tighten it.

Note: When tightening the screw, take care not to push the pressing rail downward. The sliding pressure is determined by the rail holding springs (192) and (211).

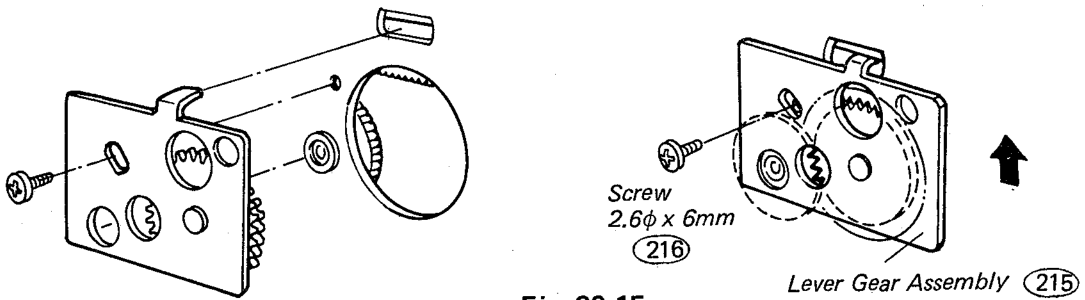

Screw
2.6ϕ x 6mm
(216)
Lever Gear Assembly (215)

Fig. 20-15

(6) Mount the lever gear assembly, and push it in the arrow direction shown in Fig. 20-15 and tighten the screw(216).

(7) Fix the main chassis (131) with three screws (130) and (138). Mount left and right sides of the chassis mentioned in step 3 in disassembling.

(8) Move the slide rail. Thighten the screw (176) securing the wire securing plate (174). Mount the damper spring(144). Finally, mount the disc cover.

(9) After mounting the disc holder, remove the E-ring (112) and remount the damper gear (111) so that the damper gear and bias spring ㉘ are mounted as shown in Fig. 20-16. Turn the gear of the damper gear (111) lightly in direction shown by an arrow and check if the damper gear is returned by the bias spring force. (The flat part of the damper gear should become almost horizontal.)

Note 1: During the operation, the short jumper of the pickup should be connected.

Note 2: Avoid touching the lens of the pickup.

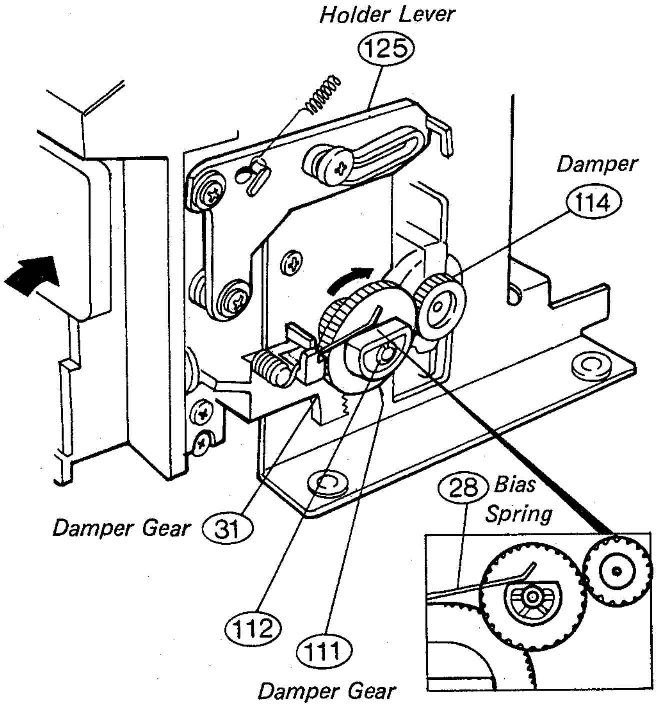
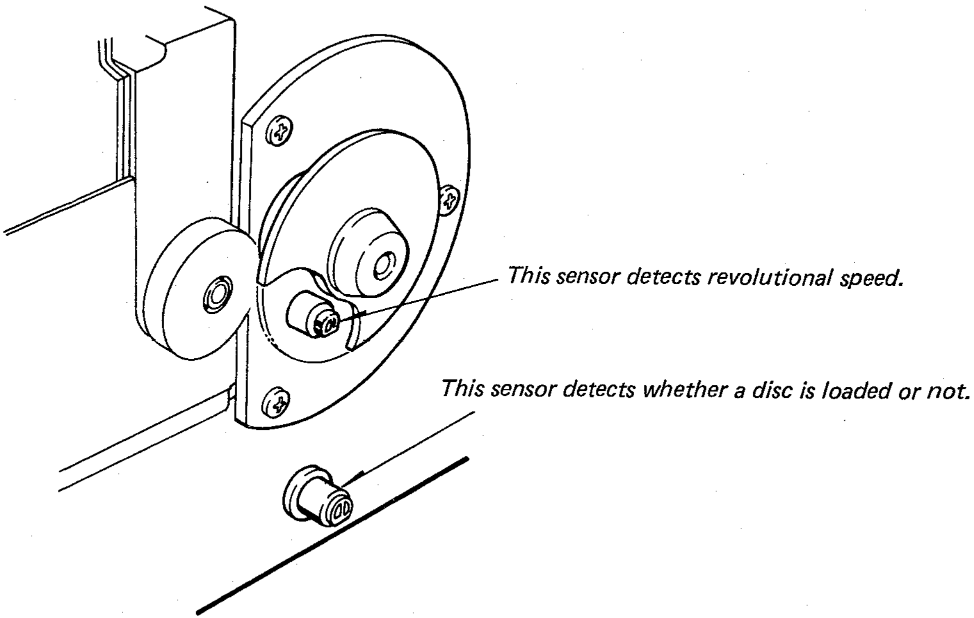

Holder Lever
(125)
Damper
(114)
Damper Gear ㉛
㉘ Bias Spring
(112)
(111)
Damper Gear

Fig. 20-16

5. REPLACEMENT METHOD FOR REVOLUTION DETECTOR AND DISC (LOADING) SENSORS

When replacing the sensors, first remove the disc holder by referring to "Removal of Disc Holder", and then remove all the components described in the procedures up to "Removal of Main Chassis". Remove main chassis securing screws(151)and(154)and Feed Motor(160). Finally, remove P.C.B securing screw and each sensor can be removed.

Mounting Positions of Sensors



This sensor detects revolutional speed.

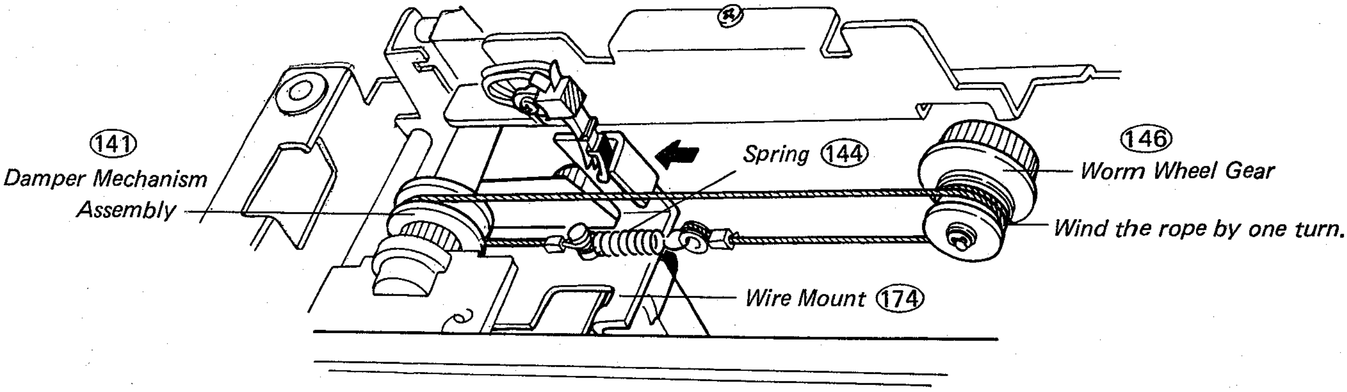
This sensor detects whether a disc is loaded or not.

Fig. 20-17

6. REPLACEMENT OF WIRE ROPE

(1) To replace the wire rope assembly, remove the wire spring(144)of the wire mount assembly and disconnect one wire.

(2) To mount a new wire rope, hook the wire mounting ring on the wire mount(174), and wind and wire rope once around the wire mounting part of the worm wheel gear(146). Then connect the spring on the wire mount.



Wind the rope by one turn.

Fig. 20-18

[21] ADJUSTMENT OF MECHANISM

1. ADJUSTMENT OF PICKUP

There are three adjusting parts. Movement of the pickup is explained here when electrical adjustment is made.

- The pickup movement is defined as against the objective lens.
- Loosen securing screw relating to the direction to be adjusted the extent which allows pickup to move (temporal tightening).

(1) Adjustment in Back and Forth direction
Turn back and forth adjusting nut provided at a side of pickup clockwise from the reference position to move the objective lens forward, and counterclockwise to rearward. (Fig. 21-2)

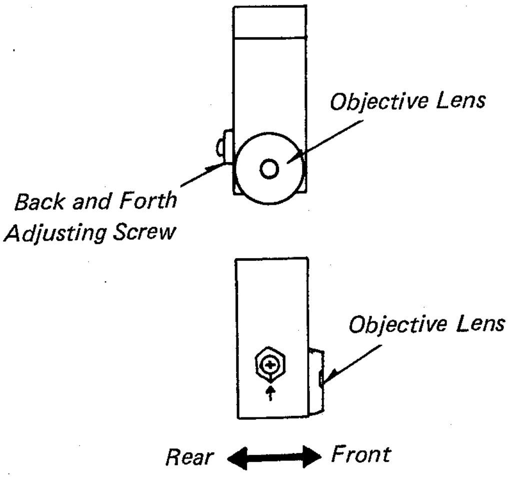

Objective Lens
Back and Forth
Adjusting Screw
Objective Lens
Rear
Front

Fig. 21-2

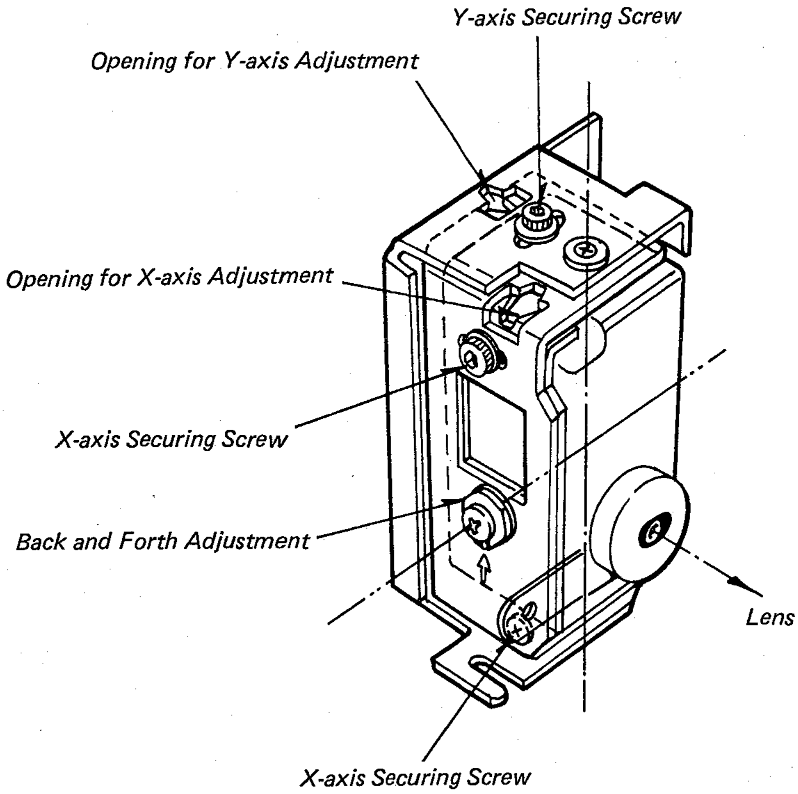

Y-axis Securing Screw
Opening for Y-axis Adjustment
Opening for X-axis Adjustment
X-axis Securing Screw
Back and Forth Adjustment
Lens
X-axis Securing Screw

Fig. 21-1

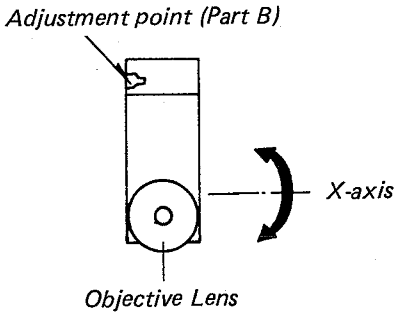

Adjustment point (Part B)
X-axis
Objective Lens

Fig. 21-3

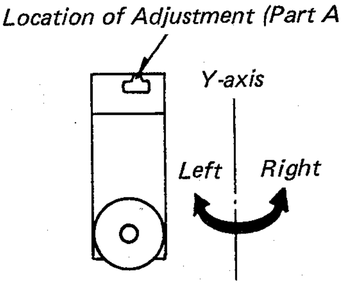

Location of Adjustment (Part A)
Y-axis
Left
Right

Fig. 21-4

(2) Slant adjustment around X-axis
Insert a minus screwdriver into the X-axis adjusting hole at part B.
Turn the screw clockwise to move the lens upward, and counterclockwise to downward. (Fig. 21-3)

(3) Slant adjustment around Y-axis
Insert a minus screwdriver into the Y-axis adjusting hole at the part A . Turn it counterclockwise to move the object lens left, and clockwise to right. (Fig. 21-4)

2. ADJUSTMENT OF MECHANISM

(1) Solenoid Ⓐ

Operate the solenoid Ⓐ continuously and move the solenoid Ⓐ back and forth so that clearance between the eject arm and lock slider becomes 0.6 ∿ 1mm.

(2) Solenoid Ⓑ

Operate the solenoid Ⓑ continuously and move the solenoid Ⓑ back and forth so that the clearance between the lock slider hook and disc holder A hook becomes 0.6 ∿ 1mm.

- When the eject button is pressed, there should be a clearance of 0.6 ∿ 1mm from the position at which the hook is disengaged.

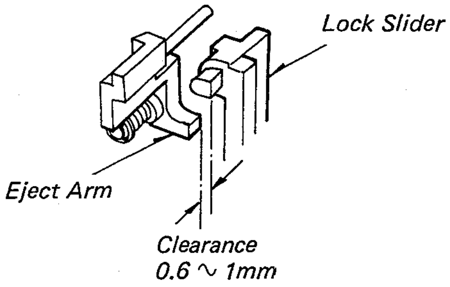

Lock Slider
Eject Arm
Clearance
0.6 ∿ 1mm

Fig. 21-5

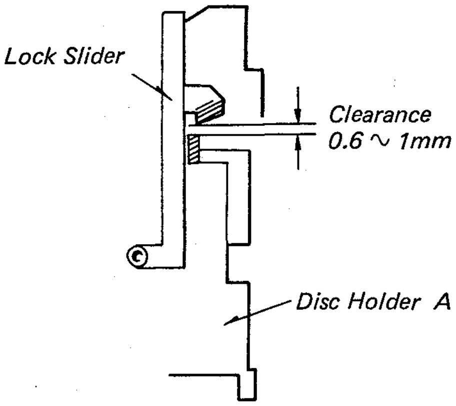

Lock Slider
Clearance
0.6 ∿ 1mm
Ⓒ
Disc Holder A

Fig. 21-6

[22] EXPLODED VIEW MECHANISM

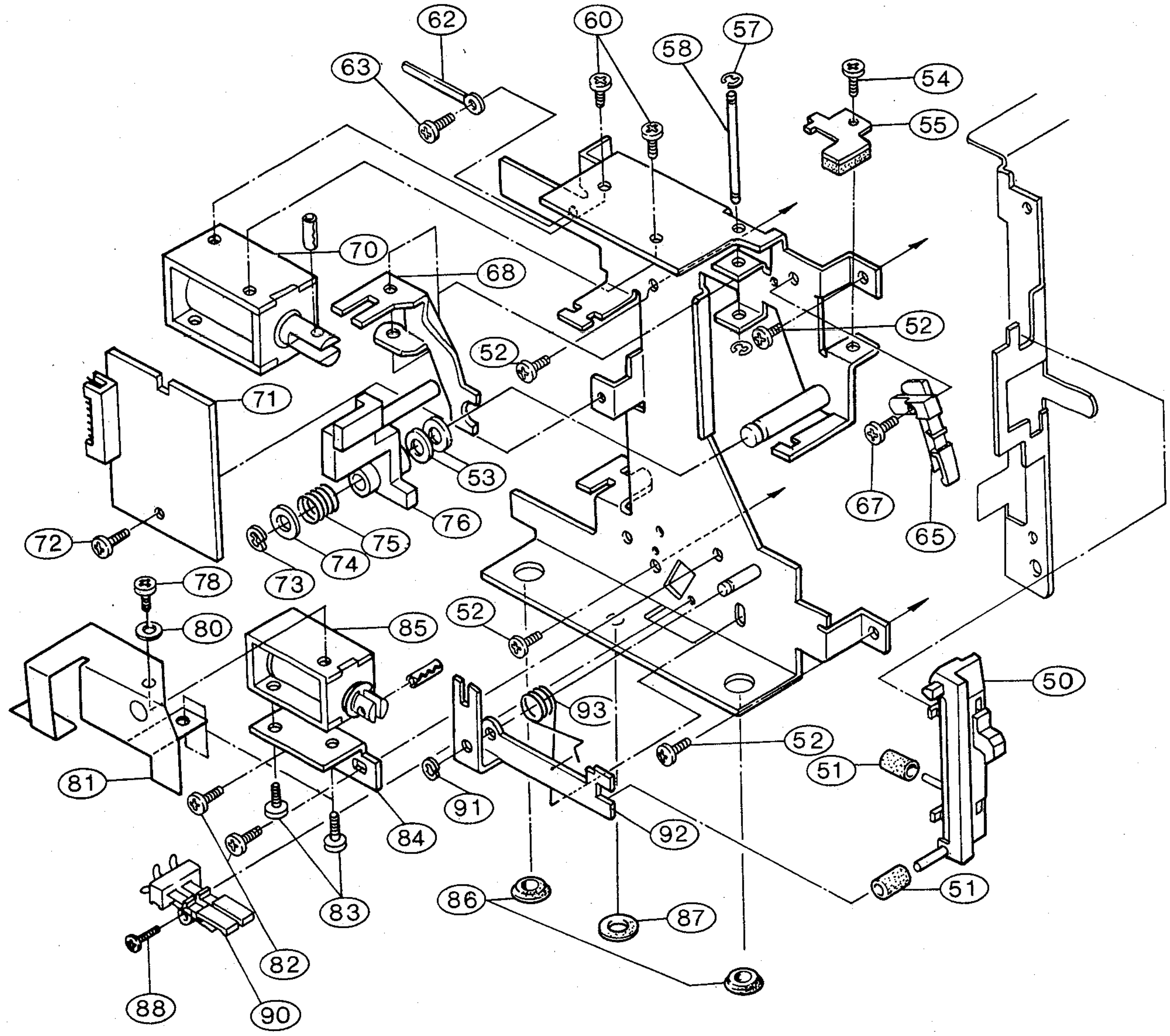
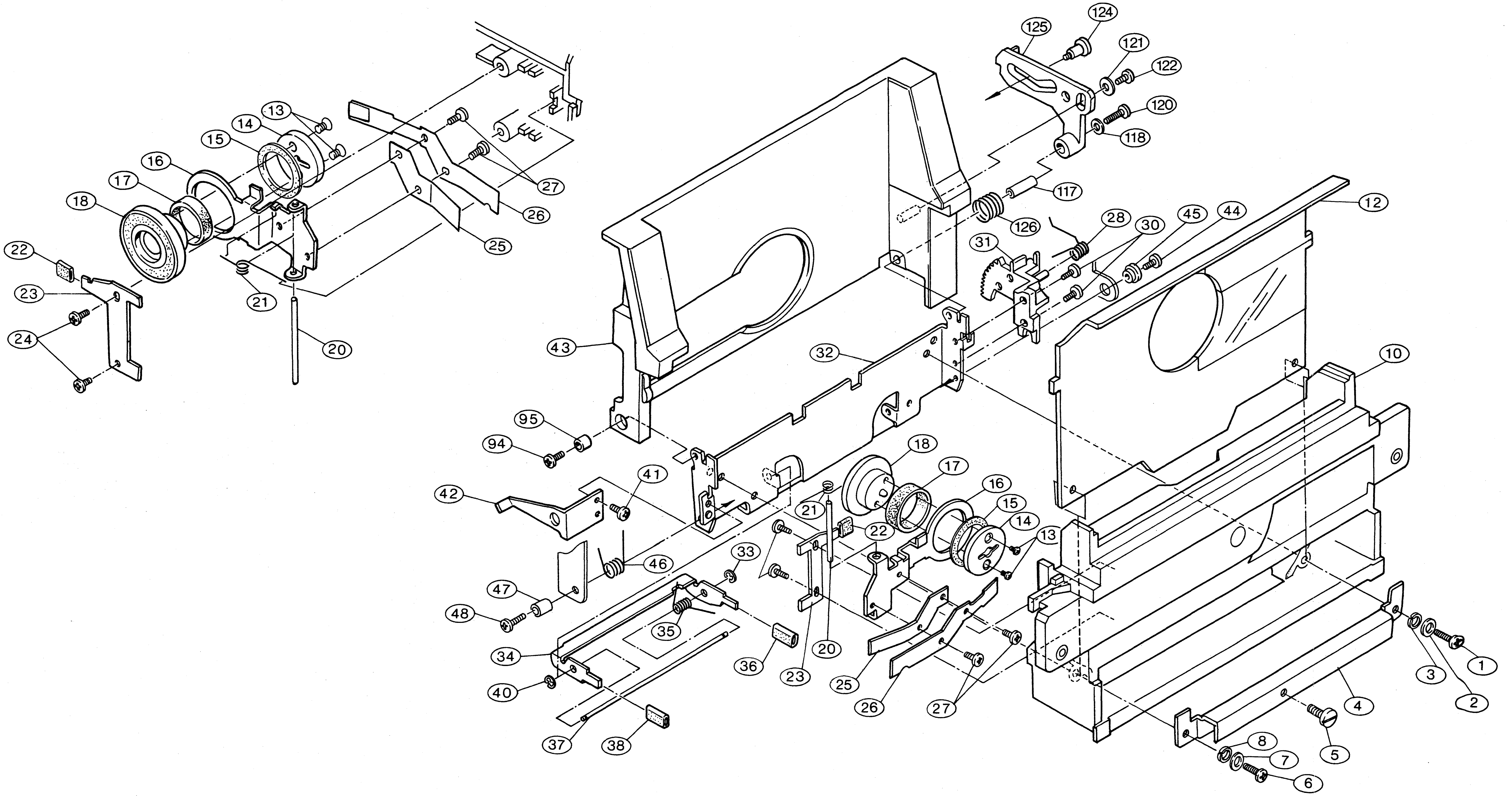

62
60
57
58
63
54
55
70
68
52
52
71
53
76
75
72
74
73
78
80
85
52
93
50
52
51
81
91
84
92
83
86
87
51
82
88
90
67
65

Fig. 22-1



(125)
(124)
(121)
(122)
(120)
(118)
(117)
(126)
(12)
(13)
(14)
(15)
(16)
(17)
(18)
(27)
(26)
(25)
(22)
(23)
(21)
(24)
(20)
(28)
(30)
(45)
(44)
(31)
(43)
(32)
(10)
(95)
(94)
(18)
(17)
(16)
(15)
(14)
(13)
(42)
(41)
(21)
(22)
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(34)
(36)
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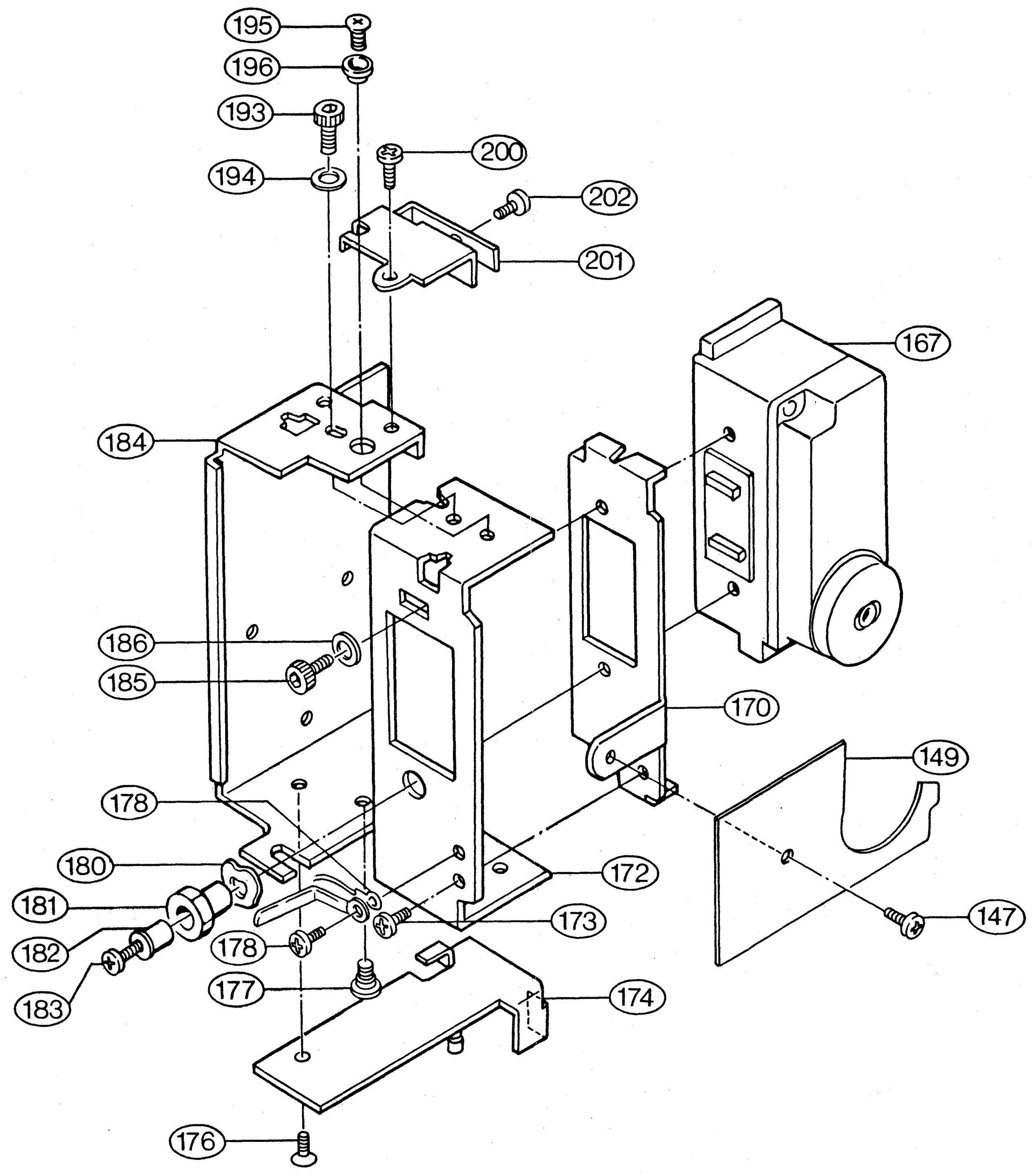
(20)
(25)
(26)
(27)
(40)
(37)
(38)
(3)
(2)
(1)
(4)
(5)
(8)
(7)
(6)

Fig. 22-2


195
196
193
194
200
202
201
167
184
186
185
170
149
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180
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182
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178
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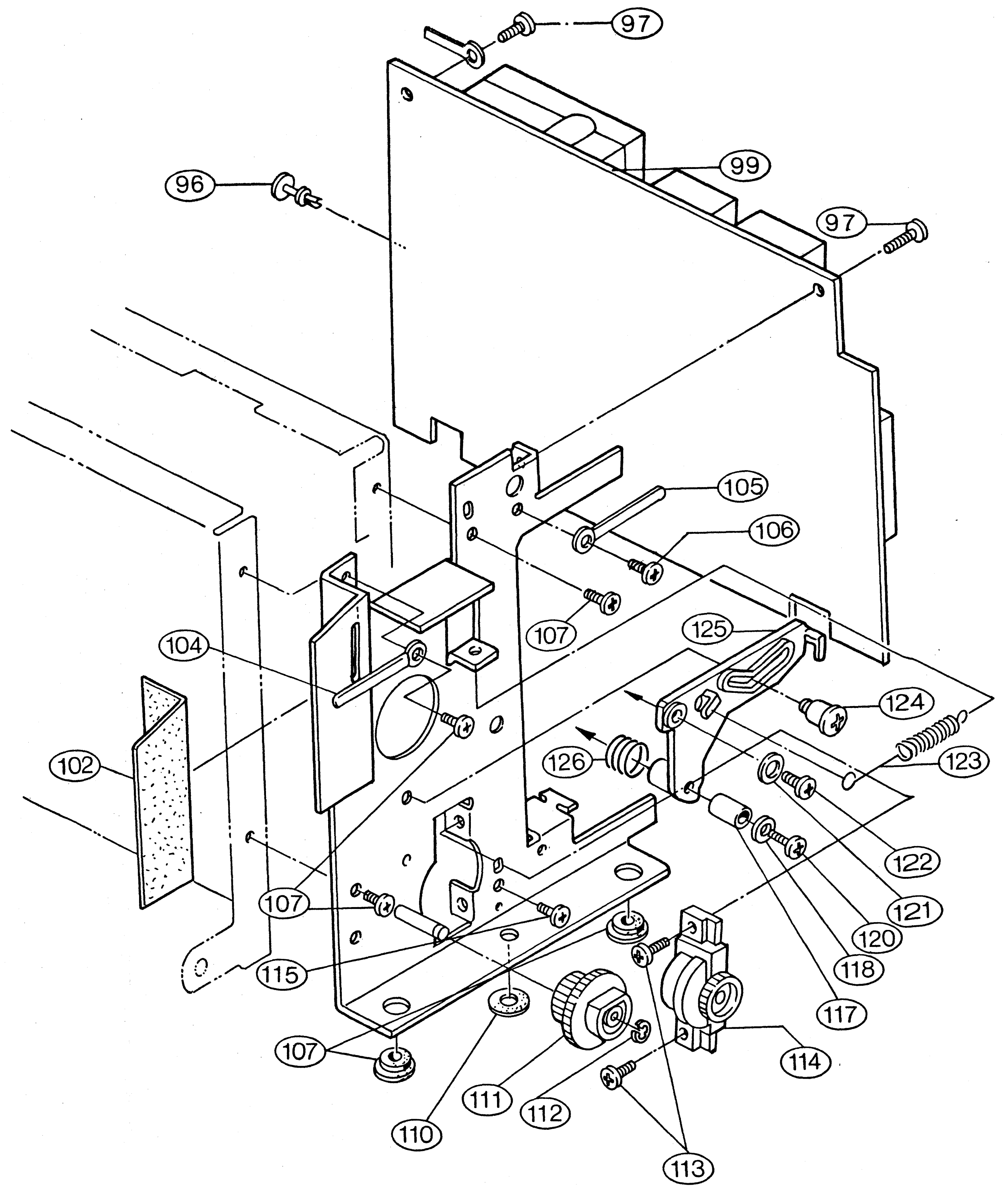
172
174
147
176

Fig. 22-3


97
99
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97
105
106
107
104
125
124
102
126
123
122
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117
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112
114
113

Fig. 22-4

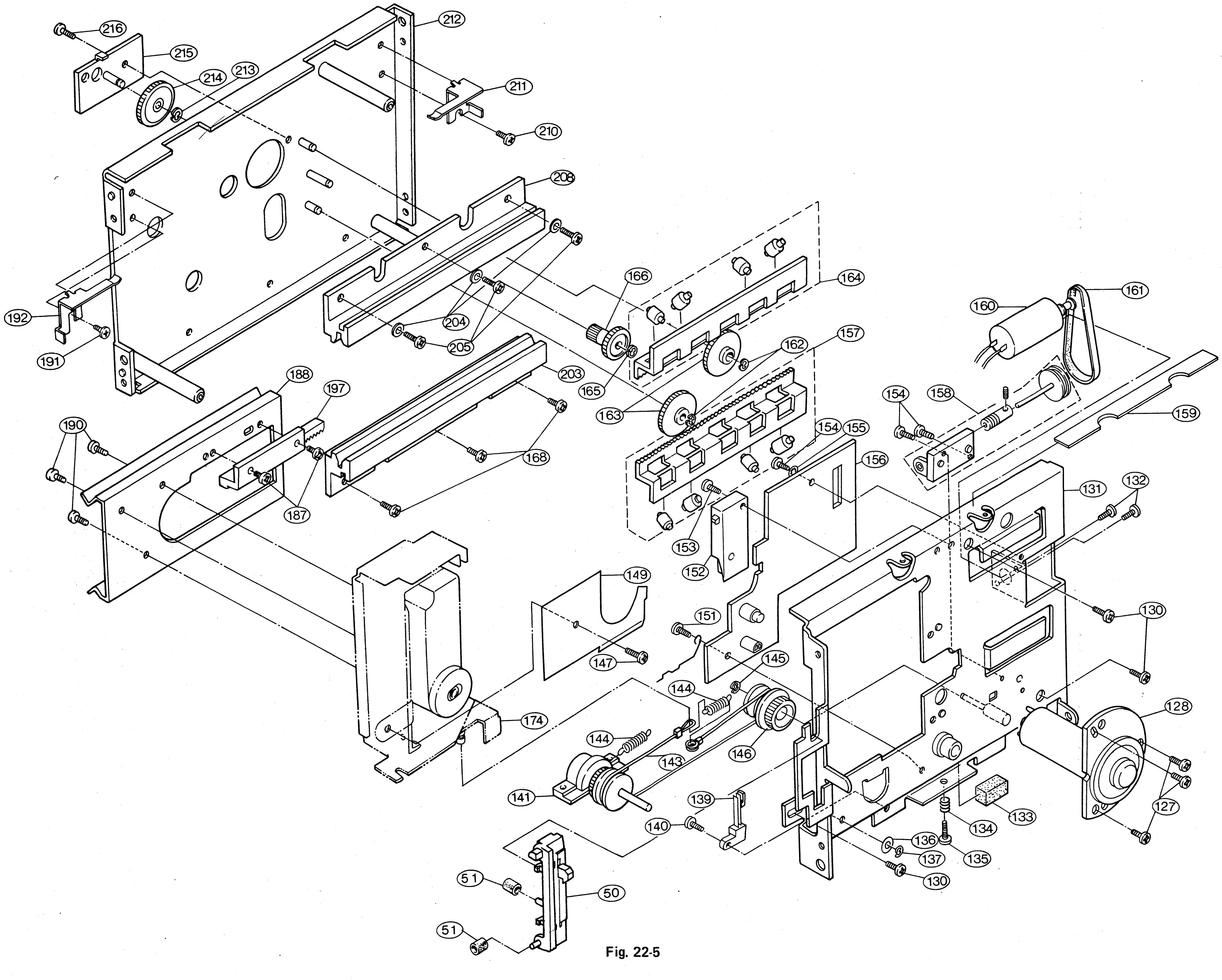


Fig. 22-5

[23] ELECTRICAL PARTS LOCATIONS AND SCHEMATIC DIAGRAMS

MECHANISM CONTROL, DISPLAY AND POWER SUPPLY

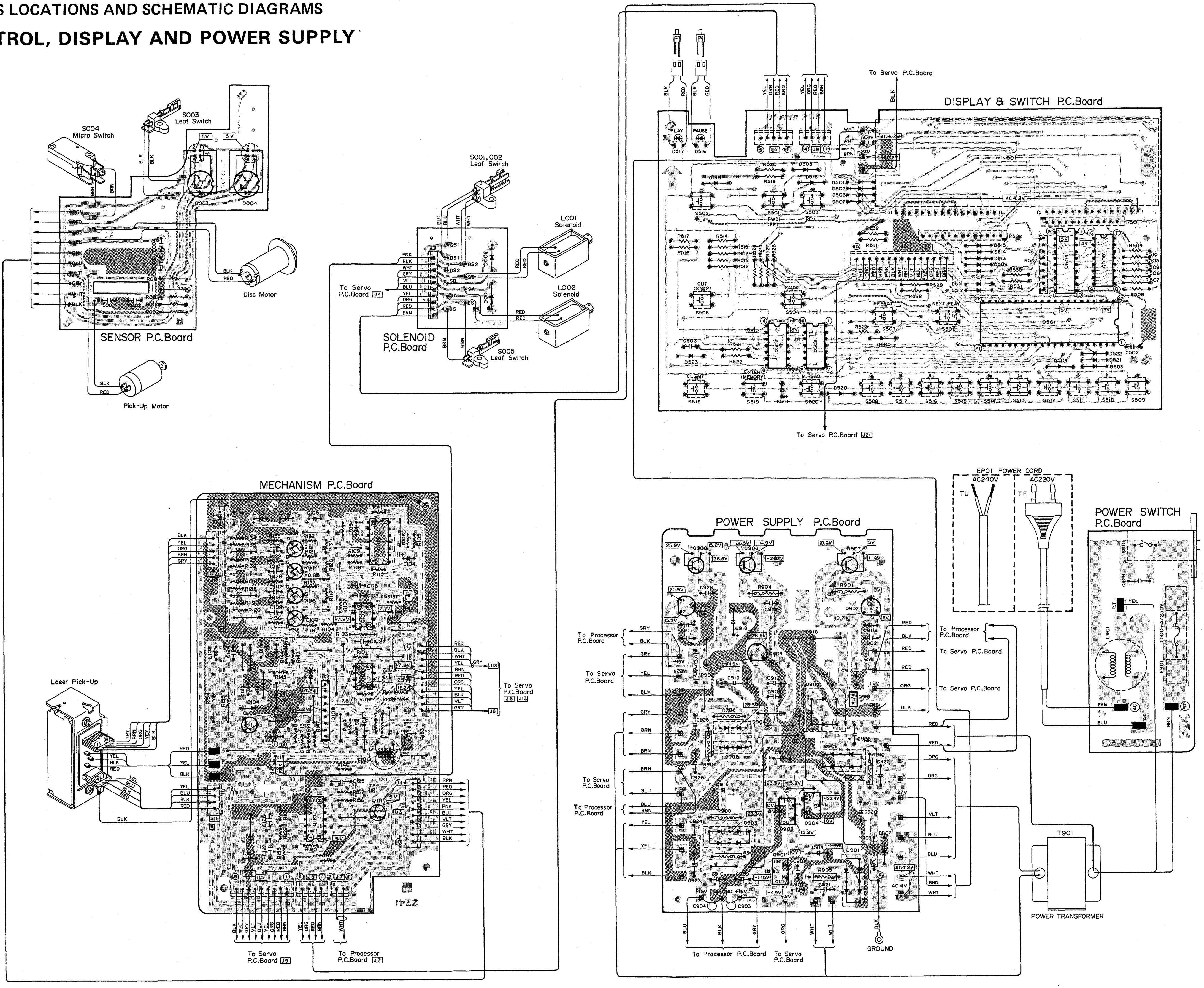
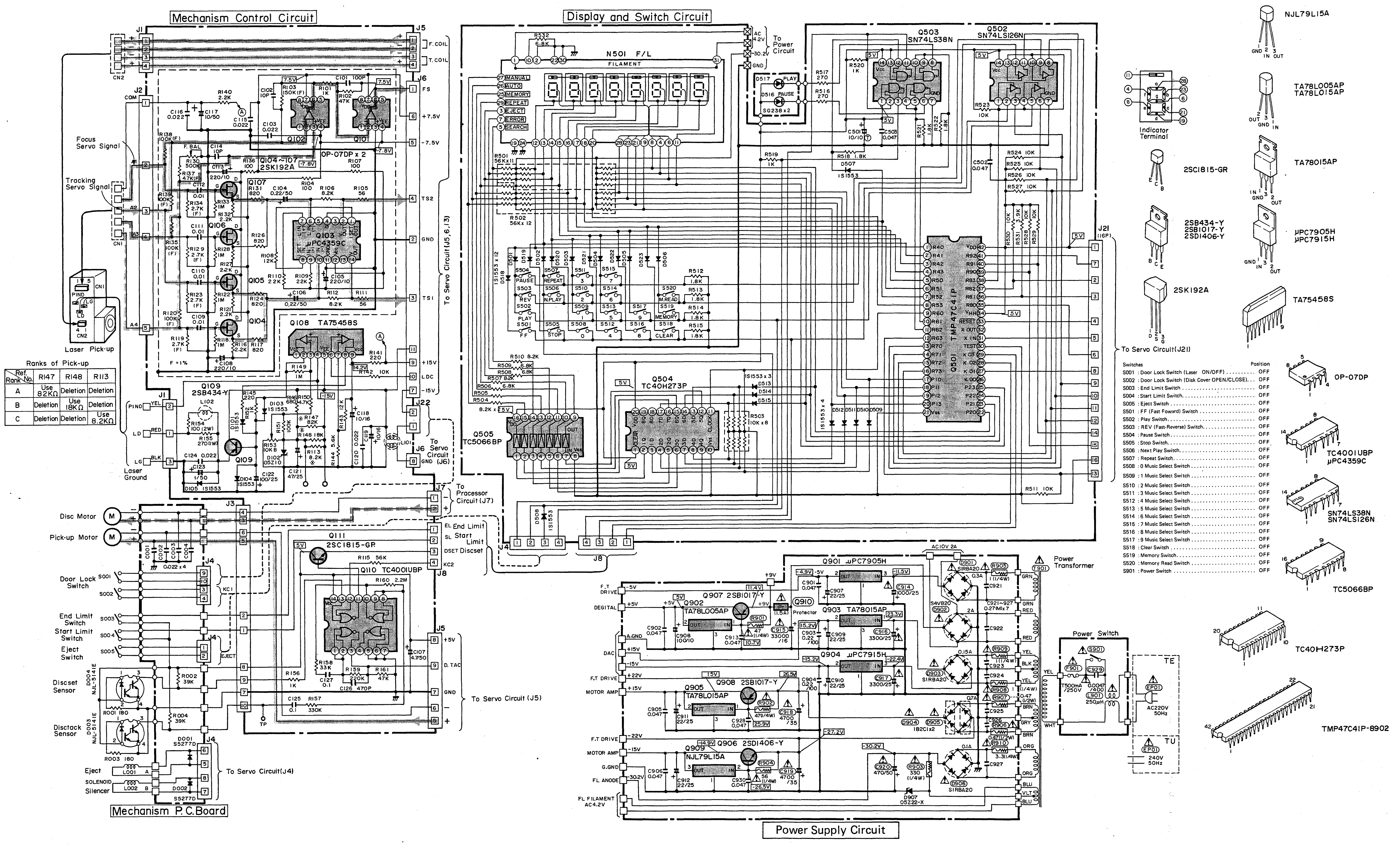

S004 Micro Switch
S003 Leaf Switch
SENSOR P.C.Board
Disc Motor
Pick-Up Motor
S001,002 Leaf Switch
L001 Solenoid
L002 Solenoid
SOLENOID P.C.Board
S005 Leaf Switch
To Servo P.C.Board J4
MECHANISM P.C.Board
Laser Pick-Up
To Servo P.C.Board J6 J13
To Servo P.C.Board J5
To Processor P.C.Board J7
To Servo P.C.Board
DISPLAY & SWITCH P.C.Board
PLAY
PAUSE
FWD
REV
CUT
RESET
NEXT PLAY
CLEAR
ENTER (MEMORY)
M.READ
To Servo P.C.Board J21
EP01 POWER CORD
AC240V
AC220V
TU
TE
POWER SWITCH P.C.Board
POWER SUPPLY P.C.Board
To Processor P.C.Board
To Servo P.C.Board
T901
POWER TRANSFORMER
GROUND
To Processor P.C.Board
To Servo P.C.Board

Fig. 23-1

MECHANISM CONTROL, DISPLAY AND POWER SUPPLY


Mechanism Control Circuit
Display and Switch Circuit
Power Supply Circuit
Mechanism P.C.Board
Laser Pick-up
Focus Servo Signal
Tracking Servo Signal
Laser Ground
Q101 Q102 Q104~107 2SK192A
OP-07DP x 2
Q103 μPC4359C
Q108 TA75458S
Q109 2SB434-Y
Q110 TC4001UBP
Q111 2SC1815-GR
N501 F/L
FILAMENT
Q501 TMP47C41P
Q502 SN74LS126N
Q503 SN74LS38N
Q504 TC40H273P
Q505 TC5066BP
Q901 μPC7905H
Q902 TA78L005AP
Q903 TA78015AP
Q904 μPC7915H
Q905 TA78L015AP
Q906 2SD1406-Y
Q907 2SB1017-Y
Q908 2SB1017-Y
Q909 NJL79L15A
Q910 Protector
To Servo Circuit (J5,6,13)
To Servo Circuit (J21)
To Servo Circuit (J5)
To Servo Circuit (J4)
To Processor Circuit (J7)
To Power Circuit
Disc Motor
Pick-up Motor
Door Lock Switch
End Limit Switch
Start Limit Switch
Eject Switch
Discset Sensor
Disctack Sensor
Eject SOLENOID
Silencer
Power Transformer
Power Switch
TE
TU
AC220V 50Hz
240V 50Hz
Indicator Terminal
NJL79L15A
TA78L005AP
TA78L015AP
2SC1815-GR
TA78015AP
2SB434-Y
2SB1017-Y
2SD1406-Y
μPC7905H
μPC7915H
2SK192A
TA75458S
OP-07DP
TC4001UBP
μPC4359C
SN74LS38N
SN74LS126N
TC5066BP
TC40H273P
TMP47C41P-8902

Ranks of Pick-up

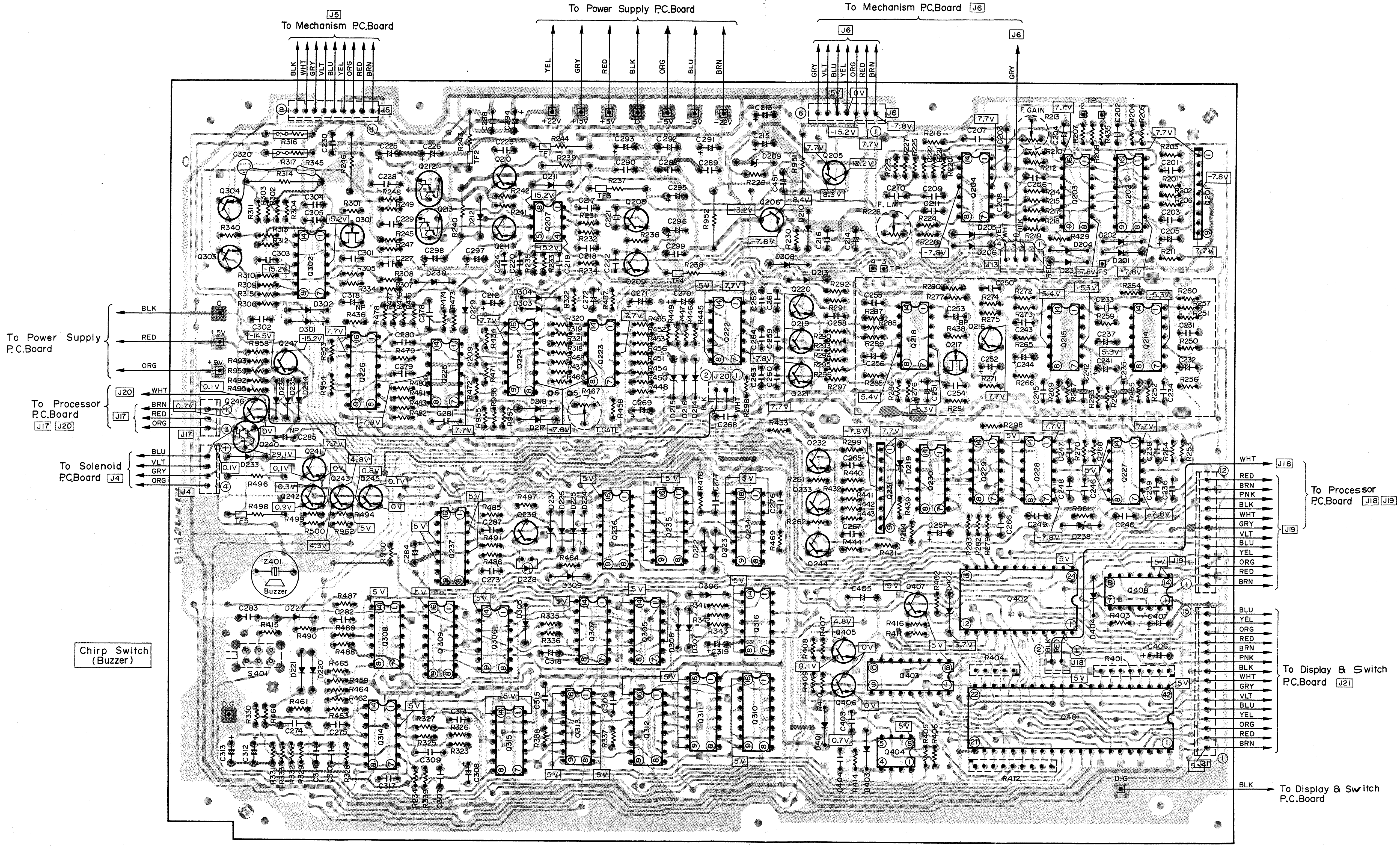
Rank \ Ref. No.	R147	R148	R113
A	Use 82KΩ	Deletion	Deletion
B	Deletion	Use 18KΩ	Deletion
C	Deletion	Deletion	Use 8.2KΩ

F = 1%

Switches	Position
S001 : Door Lock Switch (Laser ON/OFF)	OFF
S002 : Door Lock Switch (Disk Cover OPEN/CLOSE)	OFF
S003 : End Limit Switch	OFF
S004 : Start Limit Switch	OFF
S005 : Eject Switch	OFF
S501 : FF (Fast Foward) Switch	OFF
S502 : Play Switch	OFF
S503 : REV (Fast-Reverse) Switch	OFF
S504 : Pause Switch	OFF
S505 : Stop Switch	OFF
S506 : Next Play Switch	OFF
S507 : Repeat Switch	OFF
S508 : 0 Music Select Switch	OFF
S509 : 1 Music Select Switch	OFF
S510 : 2 Music Select Switch	OFF
S511 : 3 Music Select Switch	OFF
S512 : 4 Music Select Switch	OFF
S513 : 5 Music Select Switch	OFF
S514 : 6 Music Select Switch	OFF
S515 : 7 Music Select Switch	OFF
S516 : 8 Music Select Switch	OFF
S517 : 9 Music Select Switch	OFF
S518 : Clear Switch	OFF
S519 : Memory Switch	OFF
S520 : Memory Read Switch	OFF
S901 : Power Switch	OFF

Fig. 23-2

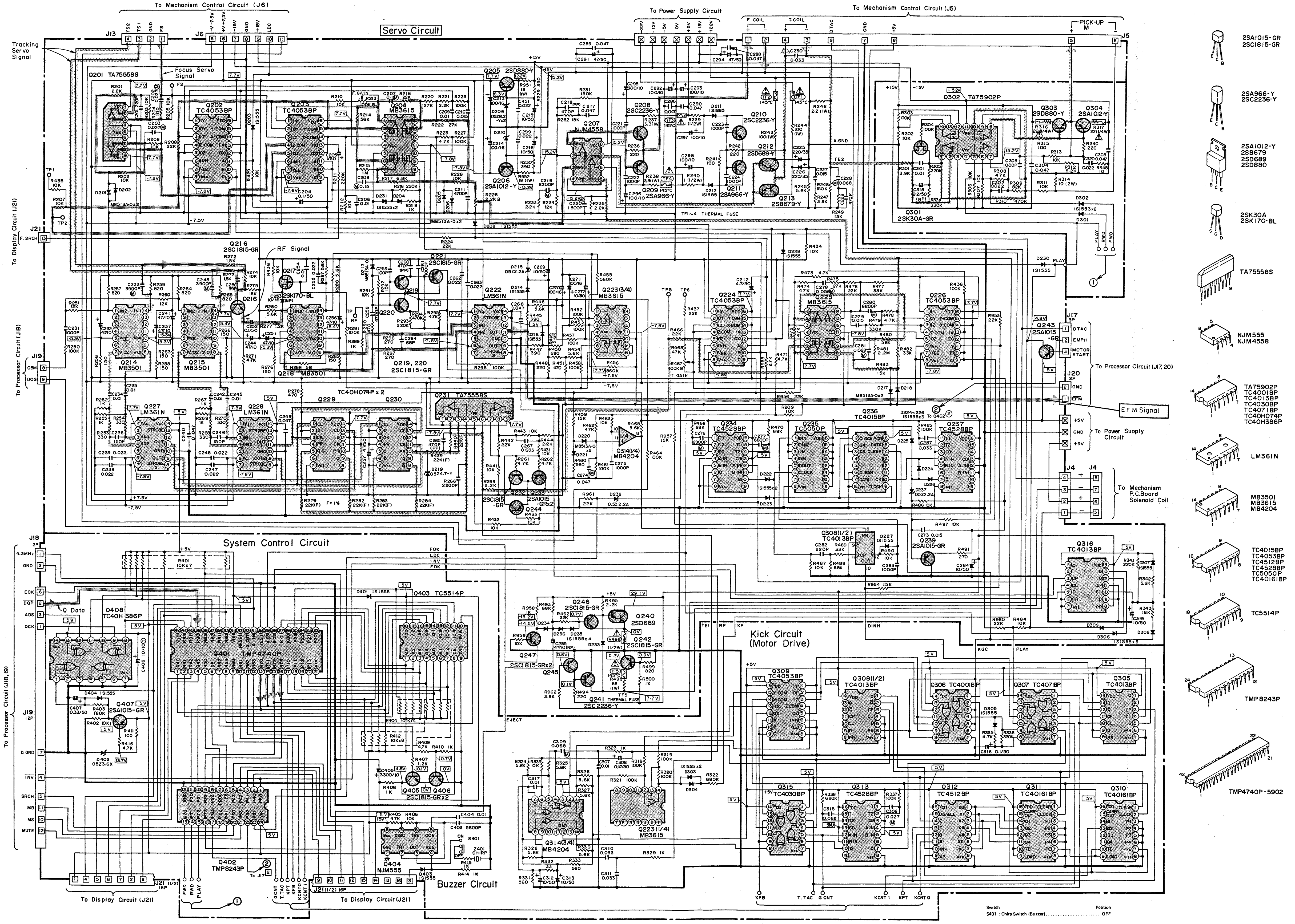
SERVO


J5
To Mechanism P.C.Board
BLK
WHT
GRY
VLT
BLU
YEL
ORG
RED
BRN
To Power Supply P.C.Board
YEL
GRY
RED
BLK
ORG
BLU
BRN
+22V
+15V
+5V
0
-5V
-15V
-22V
To Mechanism P.C.Board J6
J6
GRY
VLT
BLU
YEL
ORG
RED
BRN
J6
GRY
To Power Supply P.C.Board
BLK
RED
ORG
To Processor P.C.Board J17 J20
J20 WHT
J17 BRN
RED
ORG
To Solenoid P.C.Board J4
BLU
VLT
GRY
ORG
Chirp Switch (Buzzer)
Z401
Buzzer
S401
D.G
WHT J18
RED
BRN
PNK
BLK
WHT
GRY
VLT
BLU
YEL
ORG
RED
BRN
J19
To Processor P.C.Board J18 J19
BLU
YEL
ORG
RED
BRN
PNK
BLK
WHT
GRY
VLT
BLU
YEL
ORG
RED
BRN
To Display & Switch P.C.Board J21
D.G
BLK
To Display & Switch P.C.Board

SERVO P.C.Board

Fig. 23-3

SERVO



To Mechanism Control Circuit (J6)
To Power Supply Circuit
To Mechanism Control Circuit (J5)
Servo Circuit
J13
J6
J5
F. COIL
T. COIL
PICK-UP
Tracking Servo Signal
Focus Servo Signal
Q201 TA75558S
Q202 TC4053BP
Q203 TC4053BP
Q204 MB3615
Q205 2SD880-Y
Q206 2SA1012-Y
Q207 NJM4558
Q208 2SC2236-Y
Q209 2SA966-Y
Q210 2SC2236-Y
Q211 2SA966-Y
Q212 2SD689-Y
Q213 2SB679-Y
TF1-4 THERMAL FUSE
Q301 2SK30A-GR
Q302 TA75902P
Q303 2SD880-Y
Q304 2SA1012-Y
To Display Circuit (J21)
J21
F. SRCH
RF Signal
Q214 MB3501
Q215 MB3501
Q216 2SC1815-GR
Q217 2SK170-BL
Q218 MB3501
Q219, 220 2SC1815-GR
Q221 2SC1815-GR
Q222 LM361N
Q223 (3/4) MB3615
Q224 TC4053BP
Q225 MB3615
Q226 TC4053BP
To Processor Circuit (J19)
J19
OSM
DOG
Q227 LM361N
Q228 LM361N
Q229
Q230
TC40H074P x 2
Q231 TA75558S
Q232, 233 2SC1815-GRx2
Q234 TC4528BP
Q235 TC5050P
Q236 TC4015BP
Q237 TC4528BP
Q243 2SA1015-GR
J17
DTAC
EMPH
MOTOR START
To Processor Circuit (J17, 20)
J20
GND
EFM
EFM Signal
To Power Supply Circuit
J4
To Mechanism P.C.Board Solenoid Coil
Q308 (1/2) TC4013BP
Q239 2SA1015-GR
Q316 TC4013BP
System Control Circuit
J18
4.3MHz
GND
EOK
DGP
ADS
QCK
Q Data
Q408 TC40H386P
Q401 TMP4740P
Q403 TC5514P
Q407 2SA1015-GR
To Processor Circuit (J18, 19)
D. GND
INV
SRCH
MB
MS
MUTE
Q402 TMP8243P
Q404 NJM555
Q405, 406 2SC1815-GRx2
S401 CHIRP
Buzzer Circuit
To Display Circuit (J21)
FWD
RWD
PLAY
Q246 2SC1815-GR
Q240 2SD689
Q242 2SC1815-GR
Q247 2SC1815-GRx2
Q245
Q241 2SC2236-Y
THERMAL FUSE
EJECT
Kick Circuit (Motor Drive)
Q309 TC4053BP
Q308 (1/2) TC4013BP
Q306 TC4001BP
Q307 TC4071BP
Q305 TC4013BP
Q314 (3/4) MB4204
Q223 (1/4) MB3615
Q315 TC4030BP
Q313 TC4528BP
Q312 TC4512BP
Q311 TC40161BP
Q310 TC40161BP
KFB
T. TAC
G CNT
KCNT 1
KPT
KCNT 0
Switch
Position
S401 : Chirp Switch (Buzzer) .... OFF
2SA1015-GR
2SC1815-GR
2SA966-Y
2SC2236-Y
2SA1012-Y
2SB679
2SD689
2SD880
2SK30A
2SK170-BL
TA75558S
NJM555
NJM4558
TA75902P
TC4001BP
TC4013BP
TC4030BP
TC4071BP
TC40H074P
TC40H386P
LM361N
MB3501
MB3615
MB4204
TC4015BP
TC4053BP
TC4512BP
TC4528BP
TC5050P
TC40161BP
TC5514P
TMP8243P
TMP4740P-5902

Fig. 23-4

PROCESSOR

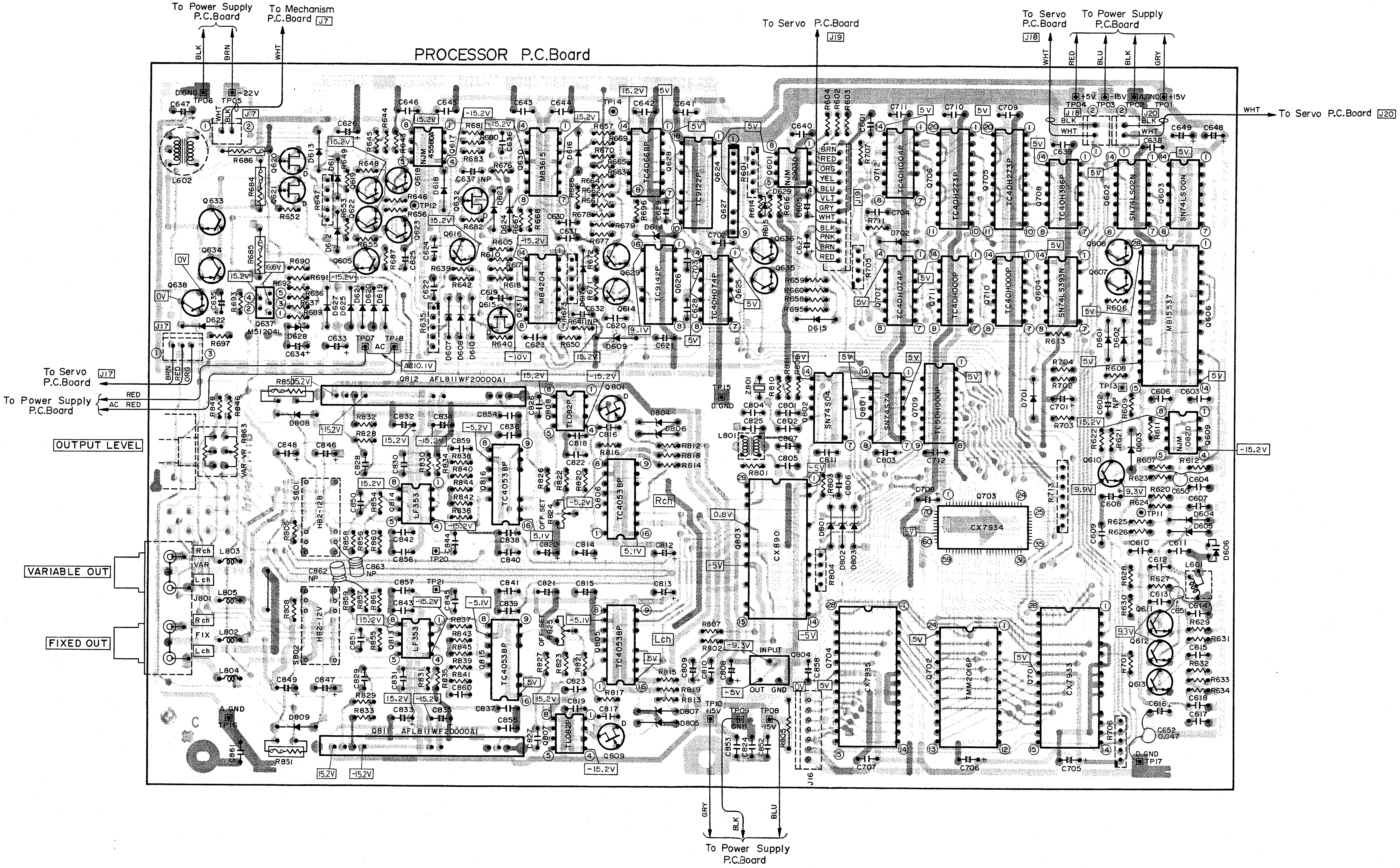

PROCESSOR P.C.Board
To Power Supply P.C.Board
To Mechanism P.C.Board J7
To Servo P.C.Board J19
To Servo P.C.Board J18
To Power Supply P.C.Board
To Servo P.C.Board J20
To Servo P.C.Board J17
To Power Supply P.C.Board
OUTPUT LEVEL
VARIABLE OUT
FIXED OUT
To Power Supply P.C.Board
BLK
BRN
WHT
RED
BLU
GRY
ORG
D.GND TP06
TP05 -22V
+5V TP04
-15V TP03
A.GND TP02
+15V TP01
A.GND TP16
D.GND TP17
TP15 D.GND
TP10 +15V
TP09 GND
TP08 -15V
AFL811WF20000A1
NJM4558DX
MB3615
TC4066BP
TC9122P
NJM2903D
MB4204
TC9142P
TC40H074P
TC40H004P
TC40H273P
TC40H386P
SN74LS02N
SN74LS00N
TC40H000P
SN74LS393N
MB15537
SN74S04
SN74S74
TC50H000P
CX7934
CX890
CX7933
MM2016P
TL082P
LF353
TC4053BP
HB2-12B
HB2-12V
NJM4558D
M5120L
Rch
Lch
VAR
FIX
INPUT
OUT GND
OFF SET

Fig. 23-5

PROCESSOR

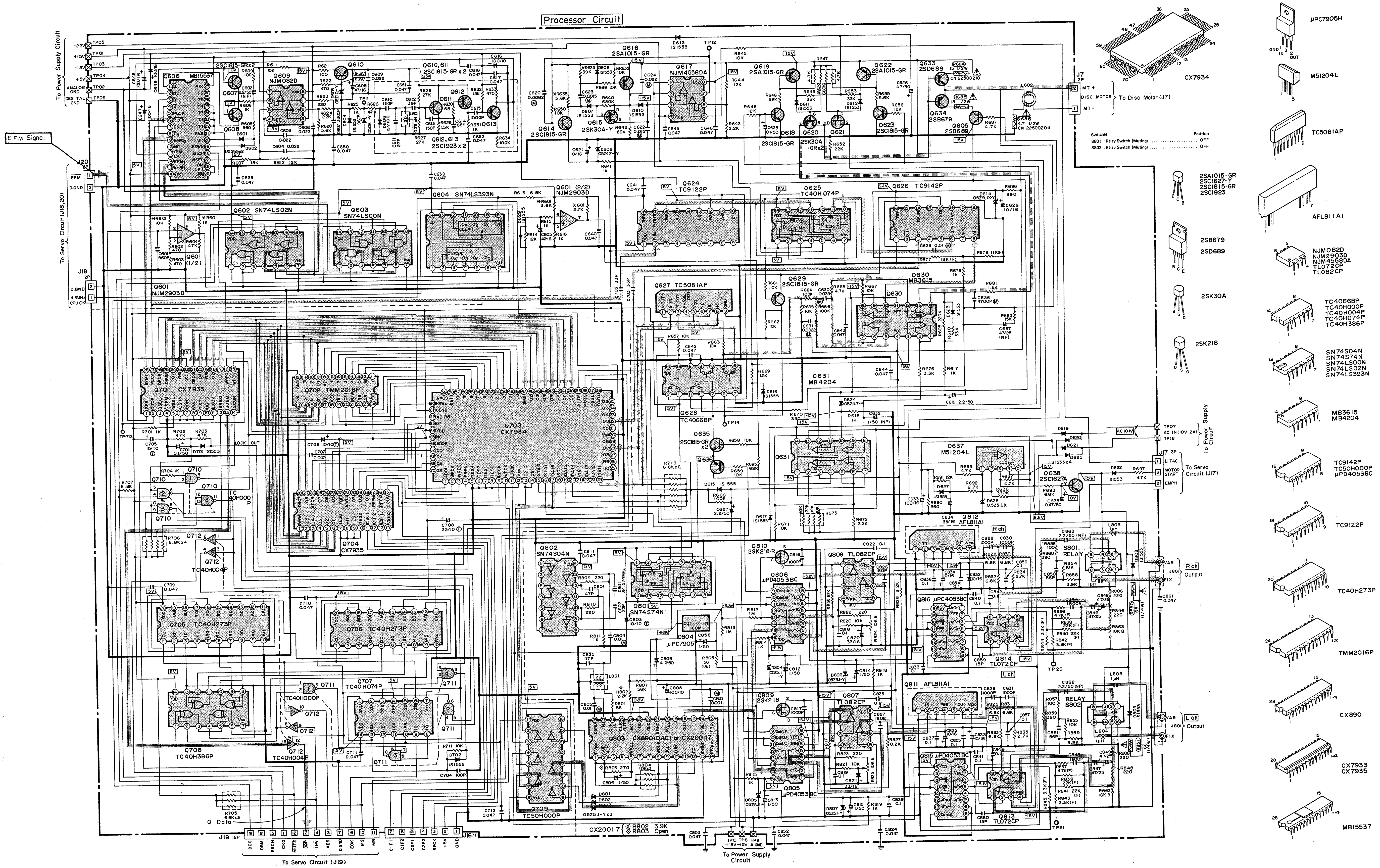

Processor Circuit
To Power Supply Circuit
EFM Signal
To Servo Circuit (J18,20)
Q606 MB15537
Q609 NJM082D
Q610
Q610,611 2SC1815-GR x 2
Q612,613 2SC1923 x 2
Q616 2SA1015-GR
Q617 NJM4558DA
Q619 2SA1015-GR
Q622 2SA1015-GR
Q633 2SD689
Q634 2SB679
Q605 2SD689
Q614 2SC1815-GR
Q615 2SK30A-Y
Q618 2SC1815-GR
Q620 Q621 2SK30A-GRx2
Q623 2SC1815-GR
J7 2P
MT+
MT-
DISC MOTOR
To Disc Motor (J7)
CX7934
Switches
Position
S801 : Relay Switch (Muting) OFF
S802 : Relay Switch (Muting) OFF
Q602 SN74LS02N
Q603 SN74LS00N
Q604 SN74LS393N
Q601 (2/2) NJM2903D
Q601 (1/2)
Q601 NJM2903D
Q624 TC9122P
Q625 TC40H074P
Q626 TC9142P
Q627 TC5081AP
Q629 2SC1815-GR
Q630 MB3615
Q628 TC4066BP
Q631 MB4204
Q701 CX7933
Q702 TMM2016P
Q703 CX7934
Q704 CX7935
Q710
TC 40H000 P
Q712 TC40H004P
Q635 2SC1815-GR x2
Q636
Q637 M51204L
Q638 2SC1627A
Q812 AFL811A1
Q802 SN74S04N
Q801 SN74S74N
Q804 µPC7905
Q806 µPD4053BC
Q808 TL082CP
Q810 2SK218-R
Q816 µPC4053BC
Q814 TL072CP
S801 RELAY
S802 RELAY
R ch
L ch
J801
VAR
FIX
R ch Output
L ch Output
Q705 TC40H273P
Q706 TC40H273P
Q708 TC40H386P
Q707 TC40H074P
Q711 TC40H000P
Q709 TC50H000P
Q803 CX890(DAC) or CX20017
Q809 2SK218
Q807 TL082CP
Q805 µPD4053BC
Q811 AFL811A1
Q815 µPD4053BC
Q813 TL072CP
CX20017 ※R802 3.9K ※R803 Open
J19 12P
To Servo Circuit (J19)
To Power Supply Circuit
TP07 AC IN (10V 2A)
TP18
J17 3P
D.TAC
MOTOR START
EMPH
To Servo Circuit (J17)
µPC7905H
M51204L
TC5081AP
AFL811A1
2SA1015-GR
2SC1627-Y
2SC1815-GR
2SC1923
2SB679
2SD689
2SK30A
2SK218
NJM082D
NJM2903D
NJM4558DA
TL072CP
TL082CP
TC4066BP
TC40H000P
TC40H004P
TC40H074P
TC40H386P
SN74S04N
SN74S74N
SN74LS00N
SN74LS02N
SN74LS393N
MB3615
MB4204
TC9142P
TC50H000P
µPD4053BC
TC9122P
TC40H273P
TMM2016P
CX890
CX7933
CX7935
MB15537

Fig. 23-6